Trends in the History of Science

Maria Teresa Borgato
Christine Phili
Editors

In Foreign Lands: The Migration of Scientists for Political or Economic Reasons

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Introduction

Many mathematicians, and scientists in general, have worked extensively in countries other than those of their origin. The reasons may have been, in different periods, political or economic. The lack of suitable employment opportunities in their countries, the adverse political systems and wars have often led to the emigration of scientists who played an important role in spreading scientific knowledge. This phenomenon has been recurrent in past centuries.

The present volume aims to analyse, starting from particular cases, the situations that have changed the scientific landscape, the tradition and the very future of studies and research.

Although one focus of investigation concerns personal motivations, often little known, and the political and social circumstances that determined the migrations, and their effect on the scientific careers of the protagonists, of no less importance are the repercussions that these migrations have had in regard to scientific progress in the countries of both origin and arrival.

The topics covered in this volume range from the eighteenth century to the period of the Second World War and concentrate, in particular, on Euler, Lagrange and Boscovich's scientific biographies, emigrations of scientists from France, Spain and Greece to Russia in the eighteenth and nineteenth centuries, and from Russia to France in the twentieth century, exiles from Italy before the Italian Risorgimento, migrations inside Europe, and the escape overseas of mathematicians from Nazi and Fascist regimes between the two World Wars, and the mobility of experts around the world.

Although the contributions are generally organized in chronological order in the volume, some aspects in common can be highlighted here.

The first two essays concern two of the greatest mathematicians of the eighteenth century: Euler and Lagrange, whose migrations within Europe were motivated by economic reasons and career advancements, as well as difficulties in relation to political authorities regarding non-ideological but essentially practical and administrative matters. The scientific biographies of these famous scientists have been previously studied in detail, but new documents presented here show us unknown and unexpected aspects in their relations with political power.

There are some elements common to the events in the lives of both mathematicians, in spite of the diversity in their approach to philosophy, religion, lifestyle and writing. Disappointed in their lack of career prospects, both left their countries of origin (Euler from Switzerland and Lagrange from Piedmont), never to return, and, driven by external events, they moved to different European cities. Both, at different times, were director of the mathematics class of the Berlin Academy, where their extraordinary scientific output left its mark. Both were involved in a project for a widow's pension fund of the Prussian government.

Leonhard Euler (1707–1783) initially found a post in the then-recently founded Academy in St. Petersburg, where he remained for fourteen years. The serious political instability pervading Russia determined his departure, which came just before the coup in 1741. In Berlin, during the reign of Frederick II, an enlightened but ambitious monarch, aggressive political expansion meant that Prussia was involved in a series of wars, the effects of which were also felt by Euler when his estate was sacked by Russian and Saxon troops. A deterioration in his relations with Frederick prompted him to leave Berlin and accept Catherine II's invitation to return to St. Petersburg. Euler's personality emerges in its various facets in the essay by Eberhard Knobloch, through the testimony of unknown documents, such as his collaboration as a translator of secret Russian dispatches during the Seven Years' War, or his "inflated" claim for the war damages suffered by his estate.

Joseph-Louis Lagrange (1736–1813) left Turin when all attempts at gaining recognition for his merit had failed; for this reason, he accepted an invitation from Frederick II, backed by D'Alembert, to take up the post left vacant by Euler at the Berlin Academy. A sixfold increase in salary compared to his modest position of mathematics assistant at the Artillery School in Turin was a determining factor in his decision. Lagrange remained in Berlin for twenty-one years of intense scientific activity and only left when his position was at risk of being scaled down after the death of Frederick II. Based on manuscripts and correspondences she has published, Maria Teresa Borgato presents in her essay a reinterpretation of Lagrange's scientific personality. During his period in Berlin, Lagrange took an active part in academic life, also beyond its own discipline, and was involved in subjects of humanities and social insurance, even when it brought him into conflict with exponents of Prussian politics.

Dmitri Gouzevitch's essay presents us with the adventurous events linked to the exploration of eastern Siberia and the northern Pacific. The two Delisle brothers, Joseph-Nicolas Delisle (1688–1768) and Louis Delisle de La Croyère (1685–1741), astronomers and geographers, were both summoned to the Academy of Sciences in St. Petersburg to draw up maps of many unexplored areas of the vast Russian Empire. This colossal cartographic enterprise of an Atlas of Russia reached its conclusion in the 1745 print, the so-called Kirilov Atlas. This essay focuses, in particular, on the second expedition in Kamčatka, which, having engaged more than 550 people for more than ten years, after crossing Siberia, pushed on to the furthest eastern borders of the empire, during which time Louis died of scurvy.

Joseph-Nicolas took part in the elaboration of the Atlas of Russia, but, owing to a conflict at the Academy of Sciences, he returned to France in 1747, under suspicion of espionage, as he had brought maps of Russian territories with him. In light of a careful interpretation of documents, correspondences and maps drawn up at that time, the author reassesses the role played by the Delisle brothers in contrast to the traditional Russian historiography.

The two Delisle brothers represent a striking case of scientific migration on the part of experts, summoned to other countries to apply their skills in the accomplishment of great projects. Similar situations have taken place in all epochs; this volume presents two other cases of the international migration of experts in different periods and circumstances.

Agustín de Betancourt (1758–1824) was a famous Spanish engineer who travelled abroad to France and England in order to acquire scientific and technical knowledge that would be useful for his own country; he then applied his expertise as an inventor, educator and designer, first in Spain (Madrid) and later in Russia (St. Petersburg). In the chapter devoted to him, Irina Gouzevitch describes not only his extraordinary mobility and creativity in diverse fields of mechanical engineering and public works (steam engines applied to the textile industry, dredgers, the optical telegraph, etc.), but also his organization of formation centres and technical staff (hydraulic engineers, etc.). In a period of complexity for the European political situation, which experienced the French Revolution and Napoleonic wars, followed by the restoration of old regimes, Betancourt travelled from one European capital to another, visiting many factories and engineering works, initially carrying out industrial espionage for Spain and, finally, finding himself in Russia's service managing and supervising important public works and effectively ushering in the advent of modern engineering in that country.

The impact that the migration of experts produces on the dissemination and sharing of technical–scientific knowledge, as well as the creation of a transnational network of mixed cultural competencies, is represented by the case of André Coyne (1891–1960), placed in the last part of the volume, devoted to the twentieth century, for chronological reasons. At a distance of over a century, after the Industrial Revolution had increased the demand for energy production, in the post-First World War period, hydroelectric power had become the main alternative source to fossil fuels. Up to the end of the nineteen-fifties, André Coyne was one of the world's leading engineers in the construction of dams, having designed 70 dams in 14 different countries, from France to Morocco to Zimbabwe. In the essay devoted to him, Ana Cardoso de Matos highlights Coyne's work in Portugal, where great investments had been made in hydroelectric power, as well as the creation of an international network of experts in this field, which required a mix of expertise in construction science, hydrology and geology, not to mention huge amounts of capital, both national and foreign.

Economics and politics merge with aspects of religious conflict in two cases of scientific migration reported in this volume. The first case deals with the scientist Nikephoros Theotokis (1731–1800), a native of Corfu, who undertook his formation at Padua University and the Academy of Sciences of Bologna; this choice was not unusual for a student from Corfu, since the Ionian Islands were under Venetian rule. The influence exerted by Italian mathematicians and astronomers on Theotokis' subsequent scientific output is carefully highlighted in Christine Phili's essay, which reconstructs his formation, his return to Corfu and his foundation of a school at the secondary level. Theotokis was a diacon, then a presbyter of the Orthodox Church, and, in spite of the fame he had acquired, he was obliged to close the school due to the obstacles posed by the Catholic Church. There follows an account of journeys undertaken by Theotokis in Europe: his involvement in the Orthodox educational institution, the Athonian Academy and the Academy of Iași in the principality of Moldavia, his stays in Leipzig, Constantinople and Vienna, where he published some of his works, and, in his final destination, Russia, which had become a place of refuge for Greek exiles.

Maria Giulia Lugaresi's contribution is dedicated to the celebrated Jesuit mathematician Ruggero Giuseppe Boscovich (1711–1787) and focuses on his interventions as an expert in hydraulics, in particular, regarding the regulation of rivers and ports. It was, in fact, these skills that gained him credit with the French government, following the suppression of the Society of Jesus. Boscovich not only had assignments from the Holy See, but also from the Grand Duke of Tuscany, the Republic of Venice, and other states of the Italian peninsula, and his expertise in applied mathematics was sought by various European courts. As a result of his various journeys in Europe, he came into contact with many scientists, like Clairault and Lalande, and was associated with prestigious academies such as the Royal Society of London. Shortly after the suppression of the Order on 21 July 1773, Boscovich left Italy for France, where he became Director of Naval Optics of the French Navy. In line with this new post, Boscovich concentrated his research work on aspects of optics and astronomy inherent to navigation, such as the achromatic telescope or the determination of longitude in the sea.

Besides being an example of the migration of experts, Boscovich represents an example of the controversies that the Jesuits had to face, owing to friction with political authorities in the countries where their missionary activity took them, or with other orders of the Catholic Church. The Jesuit order represented such economic power and political interference in the second half of the eighteenth century that they were progressively expelled from various countries until the order was officially suppressed by Papal Decree. It must, however, be pointed out that they managed to keep on teaching at universities, particularly in eastern Europe, in cities like Prague and Vienna, even after the order had been suppressed.

The migration of scientists for political reasons forms the subject of the other chapters of this volume across different periods of European history, from the eighteenth to the nineteenth century. The essay written by Elisa Patergnani and Luigi Pepe reconstructs, through the events of many of the most representative figures, the phenomenon of scientific emigration involving dozens of Italian scientists, first after the setback of Bonaparte's first campaign in Italy and the fall of the Jacobin Republics (1799), and then with the restoration of the old regimes after the end of the Napoleonic period (1814). In the first group of those who moved to France for various reasons deriving from the new political situation, we find the mathematicians Giambattista Venturi, Lorenzo Mascheroni, Vincenzo Brunacci and Giovanni Plana. This work highlights the influence of the French school on their scientific output and that of their pupils in the subsequent decades. The collapse of the Napoleonic government also brought about the suppression of the new education and research institutes, as well as established technical corps. The restoration period not only saw a purge of those who had collaborated with the previous government, but also reduced possibilities of being employed in the university, as well as in administration and the military corps. Among the mathematicians who, having encountered impediments to their careers, moved abroad (Russia, Germany, Switzerland, Holland, Greece, England, Argentina and Venezuela), are the cases of Ottavio Colecchi, Agostino Codazzi and Ottaviano Fabrizio Mossotti.

Among the mathematicians, Guglielmo Libri (1803–1869) was undoubtedly one of the most famous Italian exiles in the period preceding the Unification of Italy; this controversial man of science and patriot is the subject of the contribution written by Andrea Del Centina and Alessandra Fiocca, in which they reconstruct new aspects and details of the events of his life and his relationships with other European intellectuals and revolutionaries.

A member of an aristocratic family, he was an illustrious historian of mathematics, as well as a celebrated mathematician of his day. Compelled because of liberal ideas to leave Tuscany, he went to France, where, owing principally to his research on number theory, he received important appointments and academic chairs at the Collège de France and the Sorbonne. However, his political and intellectual activity in favour of his country earned him many powerful enemies, and he was accused of the embezzlement of books and manuscripts from public libraries. As a result, he left France and took refuge in London, where he was supported by some cultural circles, and lived by trading in books. Guglielmo Libri was an extraordinary collector of rare books and manuscripts, purchased all over Europe, and a passionate researcher of the history of mathematics, discovering and publishing many unedited documents. In addition to essays on Fermat, Euler and Abel and correspondences from the eighteenth century, he published his masterpiece *Histoire des sciences mathématiques en Italie* in four volumes (1838–41).

As internal and external conflicts intensified in the twentieth century, the phenomenon of scientific migration in Europe took on ever greater dimensions. The last part of this volume deals with these issues. The October Revolution and the consequent civil war gave rise to an emigration of intellectuals that did not spare the scientists.

In this volume, Sergey Demidov shows the effects the political upheaval had on the thriving Russian school of mathematics. These scientists held prominent positions in the Russian intelligentsia and were grouped around the main universities, which were all situated in the European part of the empire (St. Petersburg, Moscow, Kazan, Kharkov, Tartu, Kiev, Warsaw and Odessa). Demidov's essay outlines the two opposing tendencies in mathematical research in the two capitals of St. Petersburg and Moscow, showing how they did or did not determine emigration to the West. In St. Petersburg, the "Chebyshev school", so-called after the name of its founder, was at the apex of its success, boasting names such as Markov, Lyapunov, Steklov, Krylov and others, and was mainly oriented towards applied mathematics, whereas little consideration was given to the "metaphysical" theories, like those of Georg Cantor, or those like differential geometry, which were held to be devoid of application; in contrast, these theories engaged the attention of illustrious scholars in Moscow. In spite of the diversity of the many cases presented (namely Uspensky, Shokhat, Tamarkin, Bezikovich and Selivanov), it can be inferred that almost all of the surviving representatives of the St. Petersburg school emigrated to various Western countries (Germany, Austria-Hungary, France, Great Britain and the USA), and that most of them carried on with their research in those countries, whereas the opposite occurred in Moscow (with the exception of Kostitsyn and Kogbetliyev). The other universities in Russian provinces also suffered from the repercussions of war and political upheaval, and several mathematicians were also forced to emigrate, towards Yugoslavia, Serbia and Czechoslovakia (Alekseev, Psheborsky, Neuman, Saltykov, Bilimovich, Bunitsky, Podtyagin and Ostrovsky). On the whole, however, mathematical research continued to develop in Russia, backed by Soviet policy and encouraged by the increase in military industry before and after the Second World War.

Laurent Mazliak and Thomas Perfettini have devoted their contribution to Russian scientific emigration in the same period from the point of view of the host country. Many Russian exiles escaping from the Bolsheviks found refuge in France. The continuity of individual careers and intellectual activity was made possible, as the authors say, thanks to an organized community and intense solidarity exercised through numerous associations and organizations specifically created for mutual aid. Based on documents from the French National Archives, the authors analyse the role of the Russian Academic Group between 1920 and 1929. The association aimed to provide the Russian academics in Paris with practical and scientific support, allowing them to carry on with their work, and, at the same time, it offered the exiled Russian students formation courses, which brought together the principles of the French and Russian education systems, while conserving their knowledge of Russian culture and their mother tongue. A Commission for the Organization of Russian Education in France was created, initially presided over by the mathematician Paul Appell, and special Russian sections of Law, Letters and Sciences were created at the Sorbonne. In this chapter, particular insight is devoted to mathematics teachers and courses (Kogbetliantz and Savich), as well as to students who were initiated into careers in mathematics (Demtchenko). The policy of grants for students and the evolution of this association after the official recognition of USSR by France (1825) are also investigated.

Another contribution to this volume deals with the post-revolution emigration of Russian scientists involved in zoological research. This category of Russian exiles also found refuge in Western countries like France, Germany, the Balkans, Czechoslovakia, England and the USA. Taking as his starting point the personal events and scientific career of eleven significant cases (Wagner, Metalnikov, Davydov, Chakhotin, Shitz, Novikov, Uvarov, Hoar, Borodin, Sokolov and Filipchenko), Sergei Fokin distinguishes different kinds of emigrant, according to their opposition or otherwise to the new regime, temporary or permanent abandonment of plans to return home to continue their own work, or the fortune (or lack thereof) encountered in attaining a successful career abroad. Fokin discusses the impact of this forced emigration on the host countries. Not all of the exiled Russian zoologists were able to forge a future for themselves through their research after abandoning their homeland, but those who managed to work with foreign institutes, like the Pasteur Institute in France, made important contributions to Natural Sciences.

The last part of this volume concerns the scientific emigration both inside and outside Europe due to Nazi and Fascist policies and invasions. The first case is closely linked to the International Academy of History of Science (Académie Internationale d'Histoire des Sciences), which promoted the conference and symposium from which this volume derived.

Aldo Mieli (1879–1950), who was initially one of the promoters before becoming the permanent secretary of the International Academy of History of Science founded in 1931, is an emblematic case of the various persecutions aimed at intellectuals. Well-established as a historian of science, born into a Jewish family, and an active member of the socialist party defending freedom for homosexuals, Mieli left Italy in 1928 to find refuge in Paris, where he worked at the Centre de sinthèse. In 1939, Mieli was obliged to leave France in order to escape the Nazi occupation, and, as did many other Italian exiles, he moved to Argentina, where he founded a centre for the History of Science. However, he again became a victim of repression after the military coup of 1943. Antoni Roca-Rosell's contribution highlights Mieli's role as General Secretary of the International Academy of the History of Science in the promotion of national groups. He describes Mieli's contacts with the Spanish group and his journeys to Spain and Portugal in 1931 and 1933, the reviews that he wrote for the journal *Archeion*, which he also founded and edited, and his interest in studies on Arabic science in Spain. When the Nazis came to power in 1933, the International Academy's congress, which was to have been held in Berlin that year, was moved to Spain and Portugal. Roca Rosell investigates Mieli's part in the controversy that led to abandonment of the Spanish seat of Barcelona for the congress, and the disbandment and successive reconstitution of the Spanish group in 1936. The same year, this process came to an abrupt halt due to the outbreak of the Spanish Civil War and the disappearance or exile of its members as a result of repression, and did not restart until 1956.

The next three essays deal with the emigration of Jewish mathematicians resulting from racial persecutions. Annette Vogt leads us to the very heart of the Jewish question and the consequent emigration of mathematicians from Germany, starting from Hitler's rise to power in January 1933, after which all non-Aryans were excluded from all sectors of public life. Vogt's essay focuses on the effects on the community of German mathematicians, due to their expulsion from editorial committees of important journals in the field (Otto Blumenthal, Issai Schur, Richard von Mises) and centres of industrial research, not to mention universities, colleges and scientific academies. From 1935 on, a journal entitled "Deutsche Mathematik" was published by Ludwig Bieberbach, to which Emil Julius Gumbel replied from his exile in Paris. Vogt also investigates the political persecution of associations like the "League for Human Rights" and the "Society of Friends of New Russia", whose members included many scientists, among whom we recall here Helene Stöcker, Albert Einstein, Emil Julius Gumbel and Otto Blumenthal. Other celebrated mathematicians were either persecuted or subjected to fatal destinies: Emmy Noether, Fritz Noether, Hans Reichenbach, Richard Courant, Otto Blumenthal again, Margarete Kahn and Felix Hausdorff. The essay then deals with the organizations that offered aid to emigrants who found refuge in cities like London, Paris, Zurich and New York, and from whose lists we can deduce statistics and personal details about the lives of exiled scientists and mathematicians. Concerning mathematicians alone, the research on this emigration cannot be considered concluded; on the basis of recent research, Vogt provides the statistics and personal destinies of those lives that have been reconstructed: 127 mathematicians (including five females) emigrated to 16 different countries, among them, five to Palestine/Israel, 20 to the UK and a full 60% to the USA. Finally, many general considerations on the conditions of their lives and work in exile are deduced.

Martina Bečvářová and Jindřich Bečvář take us to Czechoslovakia. Even before its existence as an independent state in 1918, the region in central Europe composed of Bohemia and Moravia was a place of transit and political and religious conflict, and, consequently, of emigration. Governed by the Austrian Hapsburgs for centuries, the Czechs saw repression of their culture and language, as German became the official language of higher education.

This essay takes as its starting point an emigration from Bohemia in the second half of the nineteenth century, when the region, rich in mining resources, underwent a process of industrialization. With the subsequent establishment of technical schools, there was a need for teachers of mathematics with university qualifications. The demand for university teaching in the Czech language was linked to the nationalistic ambitions of the period. The significant number of teachers of mathematics who were unable to find employment in Czech schools triggered emigration towards the Balkans, or other countries within the Hapsburg Empire. A series of migrations in opposite directions then took place between the two World Wars. A wave of emigration occurred with the constitution of the Republic of Czechoslovakia after the First World War. After independence, even if the universities and schools that taught in the German language were maintained, they lost their prominent role, and many German-speaking teachers of mathematics moved to Austria and Germany (G. H. W. Kowalewski, J. Fuhrich, A. Weizsäcker, A. Lampa and R. Weitzenböck). Concomitantly, in the twenties, following the Russian Revolution, many well-off and well-educated Russian citizens constituted a welcome minority, known as the "white immigration". Some of them obtained positions at Czech universities and secondary schools (E. Bunickij and N. Podtjagin), and many Russian students completed their studies at Charles University in Prague. From the 1920s on, another wave of immigration took place towards the German

University of Prague, with German-speaking students coming from countries such as Hungary, Poland, Latvia and Ukraine, and then, in the thirties, they were joined by students fleeing from Nazi Germany and Austria (F. A. Behrend, R. Carnap and M. Pinl). At times, Czechoslovakia was merely an intermediary stop in an emigration to better positions in the USA, Canada, Great Britain, France, Switzerland, Asia or South America. Several mathematicians managed to emigrate in time during the first months of 1939, before the arrival of the Nazis in Prague; these included F. A. Behrend, L. Bers, R. Carnap, A. Erdélyi, P. Frank, P. Kuhn, K. Löwner, J. Mayer, L. W. Pollak, E. Schoenbaum and A. Winternitz. Many others, like L. Berwald, H. Falk, W. Fröhlich, E. Nohel, G. A. Pick and J. Rezek, did not leave and thus fell victim to the Nazis in concentration camps or ghettos. Others like O. Fischer, P. G. Funk, M. Pinl, K. Sitte and H. Löwig managed to survive the war and the persecutions. Towards the end of the war, there were new waves of emigration and persecution in the opposite direction: German mathematicians considered to be collaborators of the Nazi regime were arrested, some of whom managed to emigrate to Germany (e.g. F. Kraus), while others died in prisons or special camps (e.g. T. K. Vahlen and G. K. E. Gentzen).

Erika Luciano's essay deals with the exodus of Italian mathematicians following the racial laws of 1938. These laws, which were preceded and accompanied by a powerful press campaign, stipulated the removal of all Jewish teachers, employees and students from state-run universities and schools at all levels (September 5). Both the university and the Italian scientific community lost prestigious mathematicians like Vito Volterra, Guido Castelnuovo, Giulio Vivanti and Beniamino Segre. Other laws were gradually introduced to deprive Jews of further civil rights, but did not lead up to persecution until 1943–45 during the Italian Social Republic and the German occupation. This progression also accounts for the occurrence of a different type of intellectual diaspora in Italy. Luciano's contribution studies the case of the mathematician Alessandro Terracini, a professor of analytical geometry at the University of Turin. Like other Italian Jews, Terracini at first tried to continue his life despite the restrictions, given that some dispositions mitigated the difficulties (compliance of removed teachers, subsidies to Jewish schools, etc.), but then he decided to move abroad in an attempt to find a place where he could continue to develop his intellectual activity. He therefore looked for an academic position abroad with the help of colleagues such as Tullio Levi-Civita and international rescue organizations. The most sought-after destinations were the USA and the UK, but, by 1939, these countries had already welcomed a great many scientific exiles from Europe, so Terracini found a new post and life in Argentina in the Faculty of Engineering in San Miguel de Tucumán. Based on correspondences and documents, at times unpublished, Luciano reconstructs the steps of his exile and his prolific teaching and scientific activity in Argentina, where the mathematician from Turin worked to promote knowledge of and research into mathematics. In the end, as he had not personally lived through the tragedies of the fourties, he returned to Italy, where he was nominated as professor emeritus.

George Vlahakis' essay describes the upheavals in Greece, before and after the Second World War, as seen through the opposing events of two protagonists of chemical physics from that country. George Karagounis (1905–1990) had studied at the Universities of Göttingen and Freiburg, and then, with postdoctoral grants, worked in important laboratories in Munich and Trinity College, London. On his return to Greece, thanks to his excellent scientific output, he obtained a chair in chemical physics at Athens University (1932), a position that allowed him to excel in improving research and promoting the discipline by means of seminars, doctorates and publications, as well as industrial development (the first oil drilling in the Peloponnese). The war not only put a stop to his scientific activity, but also endangered his life. After 1948, the civil war in Greece encouraged Karagounis to emigrate, first to the University of Zurich and then from 1956 to 1968, to the University of Freiburg. He returned to Greece during the Regime of the Colonels to become director of the Center of Physical Chemistry at the National Hellenic Research Center in Athens, maintaining this post even after the re-establishment of democracy in 1974. One brilliant pupil of Karagounis was Elly Agallidis, the first woman in Greece to achieve a Ph.D. in chemical physics. She was sent to Munich for a specialization course tutored by Georg Maria Schwab (1899—1984). The two got married in Greece in 1939. Schwab, a man of liberal ideas and also of half-Jewish origin, left Germany for Greece to work as Agallidis's assistant in the laboratory of a company producing fertilizers. In 1941, however, on the outbreak of war between Germany and Greece, Schwab was arrested by the Greek Secret Service. Although he was liberated after the Germans took over Athens, he remained under police surveillance. At the end of the war, he finally obtained a professorship at the National Technical University of Athens, where his excellent work brought the quality of its research up to an international level. In the sixties, he once more took up his post in Munich, while maintaining his collaboration with Athens.

It is not easy, and perhaps not yet opportune, to draw general conclusions on how the tragic events such as the wars, dictatorships, persecutions and destructions that took place in the twentieth century impacted scientists and science. Even within the limited scope of this volume, we read not only of the disruption of research groups and entire national schools as a result of the suppression and emigration of their members, but also of the upsurge in the hard sciences being commanded to support the arms industry, as well as the dissemination of scientific knowledge in other countries as a result of emigration.

This volume originates from the contributions to the symposium that took place in Athens from September 12 to 15 2019, as part of the First Conference of the International Academy for the History of Science on "Science in Different Cultures and Civilizations—Towards a transcultural history of knowledge". The essays presented here have been selected, submitted to a refereeing process and editorially revised.

Even if we have tried to present different aspects and situations in relation to the historical periods, countries and scientific disciplines involved, the cases examined are only a small part of a survey of which this volume can represent a first contribution. Apart from the aforementioned and other well-known examples, this volume can stimulate new studies in this field, starting from less obvious and less well-known realities from other parts of the world.

It could, moreover, induce reflections on the effects of scientific migration during and after the end of the Cold War and on the migration of scientists in the era of globalization. The research presented here, its developments and the relevance that they cover were the subject of the discussion of a final roundtable at the end of the symposium, open to all participants, concerning, among other things, the migration of scientists from Russia and Eastern Europe to the West, internal transfers between European Union countries, and those from Asia to English-speaking countries (Great Britain, USA, Australia). We refer to some observations that emerged on that occasion.

The "Brain Drain" is a well-known phenomenon, which has been extensively debated on TV programmes and in journals. It means the substantial emigration of highly skilled individuals from their original country for reasons that include turmoil within their nation, the existence of more favourable professional opportunities in other countries or the desire to seek a higher standard of living.

European countries with a strong scientific tradition are still able to prepare university teachers and researchers at a competitive level who then migrate inside Europe or even to the USA to obtain adequate research funding and advancement of their scientific careers. Sometimes, after an initial period abroad, when they have already obtained international recognition, they are not averse to returning to their countries of origin to take up high-level roles.

In this way, the countries that invest in the formation of their scientific ruling classes actually finance the scientific research of richer countries, which offer doctoral or master students better prospects after their training. Unfortunately, research produced abroad has no repercussions in the country of formation and, as a consequence, in the long run, the quality of scientific education is also lowered.

The field of scientific research also reflects what happens in industrial production: a group of countries that invests in basic skills and does not invest in advanced research due to lack of resources or political ignorance may find they have to buy back at a high price what richer countries know how to produce by exploiting that potential.

Historical studies do not have the task of providing recipes, but they can help to analyse phenomena that may guide future choices, as what happened in the past is often repeated.

Maria Teresa Borgato
Christine Phili

Contents

Leonhard Euler in St. Petersburg and Berlin

Eberhard Knobloch

Abstract

Leonhard Euler spent nearly his whole scientific life outside Switzerland. In 1727, for economic reasons, he went to St. Petersburg. where he occupied his first paid scientific position and became, after a while, mathematics professor at the recently founded Russian Academy of Sciences. In 1741, he accepted the invitation of the Prussian king Frederick II to come to Berlin for political reasons in order to become the director of the mathematical class of the Berlin Academy of Sciences, although he remained an active member of the Russian academy. In Berlin, Euler wrote or published most of his great textbooks. It was the most fruitful period of his life, though he was also responsible for many non-mathematical tasks. His sojourn in Berlin was impaired by Frederick's three wars, especially by the Seven Years' War. He translated Russian secret dispatches for the Prussian authorities. Euler's estate outside Berlin was plundered. In 1765, he left Berlin for personal reasons in order to return to St. Petersburg, where he was heartily welcomed, dying there in 1783. The paper will focus on the Berlin period and on less known aspects of Euler activities in that city.

Keywords

Basel · Russian Academy of Sciences · Berlin Academy of Sciences · Frederick II · Catherine II · Mechanics · Arithmetic · Theory of music · Naval science · Differential calculus · Maupertuis · Seven Years' War

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1 Introduction

The Irish satirist Jonathan Swift once said: "Elephants are always drawn smaller than life, but a flea always larger" (Swift 1812, 183). Anyone who writes about the mathematician Leonhard Euler has to keep this saying in mind.

2 Situation in Basel

Leonhard Euler was born on April 15, 1707, most probably in the centre of Basel (Fellmann 2007, 11). When he was twenty years old, he left his birthplace never to come back. Why did this happen? In order to answer this question, we have to summarize his scientific activities before he left Basel.

As early as 1720, he had already enrolled at the University of Basel. Three years later, he obtained his Master's degree. In 1726, when he was still eighteen years old, he published his first, unfortunately flawed paper on isochronal curves: *Constructio linearum isochronarum in medio quocunque resistente* (*Construction of isochronal curves in any kind of resistant medium*) (Euler 1726). "The real surprise, though, of Euler's first published paper is that it was wrong. Even Euler made mistakes, and only sometimes did he find and correct them" (Sandifer 2007, 5).

After turning nineteen that same year, he submitted his paper on ship's masts, thus getting an honourable mention from the French Academy of Sciences: *Meditationes super problemate nautico, quod illustrissima regia Parisiensis academia scientiarum proposuit* (*Considerations about a nautical problem that the most famous Parisian academy of sciences proposed*) (Euler 1728).

This was at a time when Euler was looking for a suitable appointment. At the end of September 1726, Daniel I. Bernoulli informed him that the president of the newly founded Russian Academy of Sciences in St. Petersburg, Laurentius Blumentrost, had agreed to engage Euler (*Opera omnia* IV, 1, no. 90). Euler sent his letter of thanks, not of application (Thiele 1982, 30), on November 9, 1726 (*Opera Omnia* IV, 1, no. 268; Mikhailov 1957, 13 (Russian translation), 14f. (facsimile), 26), without mentioning a precise date for his arrival in the Russian city because, in reality, he had not yet decided to leave Basel:

> Monsieur Laurent Blumentrost, Très Illustre Président de l'Académie Impériale des Sciences
>
> Monsieur
>
> L'honneur que votre Excellence m'a fait de me recevoir dans Votre très Illustre Académie m'oblige à vous écrire et Vous faire mon compliment. Monsieur Bernoulli qui est à St. Pétersbourg m'a envoyé la lettre que Votre Excellence lui avez écrite où vous faitez connoître les conditions sous lesquelles Vous m'offrez l'engagement chez Votre Académie lesquelles je m'ay résolu de recevoir, et si la tempête le permettroit, je partirois encor ce mois pour vous offrir en presence mon devoir, et me sacrifier tout à fait au service de l'Académie. Mais parce que l'hyver m'empêche maintenant à partir, je m'ay proposé de commencer le voyage le prinstems qui vient et meme bien tôt au mois Mars s'il aussi plaira

à votre Excellence. J'employerai cependant tous mes efforts, pour me rendre plus habile à remplir mes devoirs et à bien servir l'Académie. Je ne souhaite que devenir en état où je pourrai à Votre Excellence rendre grâce ainsi comme je me connois être obligé et remercier cette marque de votre affection, que vous m'avez fait l'honneur de me donner. Si je Vous pourrai faire quelque plaisir qu'il soit dans le chemin, que je prendrai par où vous plaira, ce me sera très agréable et je tâcherai de vous satisfaire de tous mes Efforts. Enfin je suis et je demeure avec un très profond respect Monsieur de Votre Excellence le très obeissant et très obligé serviteur Leonh. Euler

Bâle le 9 Novembr. A 1726.

As it turns out, Euler believed that he had another possibility for obtaining a position, that is, the vacant professorship of physics at the University of Basel. Hence, on February 18, 1727, when he was still nineteen years old, he submitted his habilitation thesis without having obtained the Ph. D. degree (Euler 1727):

May it bring you happiness and good fortune: Physical dissertation on sound which Leonhard Euler, Master of the liberal arts submits to the public examination of the learned in the juridical lecture-room on February 18, 1727 at 9 o'clock looking at the free professorship of physics by order of the magnificent and wisest class of philosophers whereby the divine will is nodding assent. The most eminent young man Ernst Ludwig Burchard, candidate of philosophy, is responding.

The appendix consisted of six assertions. The third concerned a thought experiment: What would happen if a stone were dropped into a straight tunnel drilled to the centre of the earth and onward to the other side of the planet? Euler gave an absurd answer: It would reach infinite velocity at the centre and immediately return to the same point from which it had fallen.

Only in his *Mechanics*, published in St. Petersburg in 1736, did Euler justify his false solution, saying (Euler 1736, 88):

Hoc quidem veritati minus videtur consentaneum […] Quicquid autem sit, hic calculo potius quam nostro iudicio est fidendum atque statuendum, nos saltum, si fit ex infinito in finitum, penitus non comprehendere.

This seems to differ from truth […] However that may be, here we have to confide more in the calculation than in our judgment and have to confess that we do not understand at all the jump if it is done from the infinite into the finite.

In reality, Euler's mistake was caused by an impermissible exchange of limits. Curiously, Euler never recanted.

Having submitted his paper, he waited for the decision about the professorship: All of his imploring was, indeed, in vain: He did not get the position. If one critically considers his scientific publications at that time, one comes to the conclusion that this decision was justified. Yet, Euler was extremely disappointed. On April 5, 1727, he left Basel forever for economic reasons and he never returned.

3 Euler's First Stay in St. Petersburg

In September 1725, Daniel I Bernoulli, Nikolaus II Bernoulli, and Christian Goldbach had gone to St. Petersburg in order to work for the Russian Academy of Sciences, which simultaneously served as both a high school and a university. It had opened in December 1725. The Bernoullis—the so-called Swiss connection—became professors, and Goldbach a permanent secretary.

Thanks to the efforts of these three scientists, Euler was able to join them. On April 20, 1727, Christian Wolff sent a letter to him indicating that Petersburg was a paradise for scholars (*Opera omnia* IV A 1, no. 2819; Fellmann 2007, 30). On May 24, 1727, Euler arrived at the Russian city, where he remained until June 19, 1741. What was the political situation there during this period of time?

It was somewhat complicated, and, in the end, very unstable. Catherine I, the widow of Peter the Great, had died before Euler's arrival on May 8 (17), 1727. Peter's grandson Peter II (1715–1730) reigned from 1727 until 1730, and Peter's half-niece Anna Ivanovna from 1730 until 1740. Anna's nephew, the child Ivan VI, being only two months old, "reigned" from 1740 until 1741, before the palace revolution happened. The coup d'état took place on December 6, 1741, after Euler had already departed. Peter's illegitimate child, Elisabeth, was the empress from 1741 until 1762. The unstable political situation in 1741 certainly contributed to Euler's decision to leave Russia after fourteen years (Fellmann 2007, 56).

In contrast to the behaviour of his Swiss friends, Euler felt obliged to learn Russian. His first mathematical notebook contains linguistic exercises in this respect (Fig. 1).

He had to wait six years before he became professor of mathematics. First of all, Euler became a junior civil servant in the medical class for physiology. After Georg Bernhard Bülfinger's departure, he became professor of physics and a member of the academy in 1731. When Daniel I Bernoulli returned to Switzerland in 1733—Nikolaus had died shortly after his arrival at St. Petersburg—Euler finally became his successor as professor of mathematics.

Thus, four of Euler's great textbooks were written and, for the most part, also published while he was still in St. Petersburg (Euler 1736, 1738, 1739, 1749):

Mechanics, or the science of motion set forth analytically, 1736 (so-called First Mechanics),

Introduction to the art of arithmetic for the use of the high school at the Imperial Academy of Sciences in St. Petersburg, 1738,

Essay of a new theory of music set forth clearly according to the most certain principles of harmony, 1739,

Naval science, or a treatise on the construction and navigation of ships, 1738 (so-called First naval theory) (published in 1749).


Observationes in Linguam Ruthenicam
1. Mathesis.
2. Medicina.
3. Philosophia.
4. Musica.
5. Latina. ling.
6. Gallica ling.
7. Ruthenica. ling.
8. Historia
Moral.

Fig. 1 Euler's grammatical exercises in Russian. Mikhailov 1957, 25 = Archives of the Russian Academy of Sciences Fund 136, inventory 1, number 129, sheet 11 verso

4 Euler's Stay in Berlin

Euler lived in Berlin from July 25, 1741, until June 1, 1766, and from 1743, he lived in the centre of Berlin at "21, Behrenstrasse". Today, this is the address of the Bavarian Consulate. To celebrate the 200th anniversary of Euler's birth, a metallic plaque was placed on the building (Fig. 2).

The inscription means: "The mathematician Leonhard Euler , born April 15th, 1707, died September 18th, 1783, lived here from 1743 until 1766. The city of Berlin pays homage to his memory, 1907".

At the time, Frederick II (The Great) reigned over Prussia, his rule lasting from May 31, 1740 until August 17, 1786. Euler's arrival in Berlin was not, however, favourable for a meeting with the king (Knobloch 2018, 108) and his sojourn in the Prussian capita, l was overshadowed by Frederick's three wars: the first Silesian war, which lasted from December 16, 1740, until June 11, 1742, the second Silesian war from August 15, 1744, until December 25, 1745, and the Seven Years' War from May 17, 1756, until February 15th, 1763, in which Prussia and England fought against Austria, France, Russia, and Saxony.

Hence, Frederick only met Euler for the first time on September 6, 1749, more than eight years after Euler's arrival in Berlin. Moreover, the king was not very interested in such a meeting. He knew that Euler was the best mathematician of his time, but he did not understand mathematics and rejected Euler's religious attitude. Their relationship remained problematic and difficult.

Fig. 2 Plaque for Euler in the centre of Berlin. By courtesy of the archives of the Berlin-Brandenburg Academy of Sciences and Humanities

Euler's Activities Within and for the Berlin ACADEMY of Sciences

Berlin was to be Euler's most fruitful period. For the Berlin Academy of Sciences alone, he wrote ninety-three publications. Moreover, he elaborated nine great textbooks or treatises at that time, which were partly published only after his departure from the city (Euler 1744a; 1744b; 1745; 1748; 1753; 1755; 1765; 1768–1772; 1768–1770, 1794):

> *Method of finding curvilinear lines having a property to a highest or smallest degree or solution of the isoperimetric problem understood in the largest sense*, 1744,
> *Theory of the motion of planets and comets*, 1744,
> *New principles of gunnery*, 1745,
> *Introduction to the analysis of the infinite*, 1748,
> *Theory of the motion of the moon, setting forth all of its inequalities*, 1753 (so-called First lunar theory; its publication was paid for by the Russian Academy of Sciences),
> *Elements of instruction of the differential calculus together with its application in the analysis of the finite and theory of series*, 1755 (its publication was paid for by the Russian Academy of Sciences),
> *Theory of the motion of solid or rigid bodies stabilized according to the first principles of our cognition and accommodated to all motions that can fall in such bodies*, 1765 (so-called Second mechanics),
> *Letters to a German princess on diverse subjects of physics and philosophy*, 1760–1762 (published between 1768 and 1772),
> *Elements of instruction of integral calculus*, 1763 (published between 1768 and 1770 and in 1794).

Yet, Euler was involved in many other activities that concerned his daily academic and private lives. More than three thousand interesting and widely unknown documents are housed at the archives of the Berlin-Brandenburg Academy of Sciences and Humanities, that is, the former Prussian Academy of Sciences. They are enumerated in (Knobloch 1984). Many of them have been digitized and are freely available on the internet: https://euler.bbaw.de/euleriana/.

These documents are arranged into ten groups: Euler's election, Reorganization of the academy, Director of the mathematical class, Expert of the academy, Management director, Editor of the school atlas of the academy, Maps of the second edition of the school atlas, Translator for the Prussian state during the Seven Years' War, Euler's estate, Honours and medals. It should suffice to describe some examples belonging to the first, fifth, eighth, and ninth groups.

Euler's election: "Minutes of the meeting of the mathematical class on September 6th, 1742, about Euler's first participation in a meeting of the academy and his contribution to the treatises of the academy"[1] (Knobloch 1984, 345).

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[1] Archiv der BBAW, Bestand Preußische Akademie der Wissenschaften, I-IV-37, sheet 147v°–148r°.

The minutes begin by mentioning the participants present at the meeting, that is, Euler, Philipp Naudé the younger, Johann Leonhard Frisch, Johann Nathanael Lieberkühn, Johann Wilhelm Wagner, and Augustin Grischow. The minutes mention that, thanks to Euler especially, the academy is able to publish a new volume of the Academy journal *Miscellanea Berolinensia*:

> Hiernächst hat Herr Euler angezeiget, daß seit seiner Ankunft in Berlin er folgende Stücke ausgearbeitet die er den Miscellaneis gewidmet:
>
> 1° Determinatio orbitae cometae qui mense martis hujus anni 1742 fuit observatus.
>
> 2° Theoremata circa reductionem formularum integralium ad quadraturam circuli.
>
> 3° De inventione Integralium, si post integrationem variabili quantitati determinatus valor tribuatur.
>
> 4° De summis serierum reciprocarum ex potestatibus numerorum naturalium ortarum.
>
> 5° De Integratione aequationum differentialium altiorum graduum.
>
> 6° De proprietatibus quibusdam Sectionum conicarum in infinitas alias lineas curvas competentibus.
>
> 7° De resolutione Aequationis $dy + ayydx = bx^m dx$.
>
> Weil aber die fünf ersten Stücke schon einen großen Raum füllen werden, so ward beliebet die beyden lezten zu einer andern Fortsetzung zu ersparen.
>
> Then Mr. Euler informed us that since his arrival in Berlin he has elaborated the following papers which he has destined for the *Miscellanea*:
>
> 1st Determination of the motion of the comet which has been observed in March of this year 1742.
>
> 2nd Theorems concerning the reduction of integral formulas to the quadrature of the circle.
>
> 3rd On the finding of integrals, if after integration a determined value is assigned to the variable quantity.
>
> 4th On sums of series of reciprocals from powers of natural numbers.
>
> 5th On the integration of differential equations of higher degrees.
>
> 6th On some properties of conic sections that are convenient for infinitely many other curved lines.
>
> 7th On the resolution of the equation $dy + ayydx = bx^m dx$.
>
> But because the five first papers already fill a great space it has been decided to postpone the two last for another continuation.

The first five papers were indeed published in volume 7 of the *Miscellanea Berolinensia* in 1743. There, they cover the first 242 pages (Euler 1743a, b, c, d, e), with the seventh paper only being published in St. Petersburg in 1764 (Euler 1764). It is unclear what happened to the sixth paper. It is not mentioned in either (Knobloch 1984) or (Kopelevic etc. 1962), nor can it be identified by means of https://scholarlycommons.pacific.edu/euler-publications/ or (Eneström 1910–1913). Yet, the publications testify to Euler's extraordinary scientific productivity from the very beginning of his sojourn in Berlin.

Management Director

> Letter of the president of the academy P. L. M. de Maupertuis to the chief accountant D. Köhler that during his absence L. Euler will manage the affairs of the academy with the approval of the king[2]. (Knobloch 1984, 119f.)

The letter is dated April 24, 1753. It begins by saying that the pension of the chemist Andreas Sigismund Marggraf has been augmented by 200 Ecus. The crucial passage reads: "Sa Majesté ayant approuvé que je remisse le detail de l'administration de l'Académie pendant mon absence entre les mains de Monsieur le Professeur Euler, vous aurez la bonté Monsieur de payer sur ses Assignations, les dépenses journallières."

> Because her Majesty has approved that during my absence I place the academy's administration in the hands of professor Euler, you will kindly pay the daily expenses according to his assignments.

Euler remained management director until he himself left Berlin in 1766.

> Euler's application sent to the king to construct a house for the silk culture in Köpenick[3]. (Knobloch 1984, 125)

The application was written by Euler in the name of the board of directors on July 6, 1753:

The application explains that the mulberry plantation in Köpenick—which today belongs to Berlin—produces about one hundred pounds of silk annually at the time:

> Weil aber zu Verpflegung so vieler Würmer ein geräumiges Gebäu erfordert wird, so wollten wir mit Ewer Königlichen Majestät allerhöchsten Genehmhaltung noch dieses Jahr ein solches Gebäu, wovon der Riß und Anschlag hiebeygeleget ist, aufführen lassen.

> But because a spacious building is necessary in order to nourish so many worms, we intended to have such a building constructed by the very highest approval of her Royal Majesty still this year. A sketch and an estimate have been added.

Yet, this attempt to increase the earnings of the academy by producing silk—apart from the calendar privilege—was never successful.

Translator for the Prussian State During the Seven Years' War

In September 1758, during the Seven Years' War, a Russian courier, together with two Cossacks, was taken prisoner in the neighbourhood of Neustettin (today, Szczecinek, Poland). The courier carried 79 letters, that is, secret dispatches that were destined for the Russian court. As we mentioned previously, Euler had learned Russian. Hence, he was charged with the translation.

Two examples could best illustrate this work. The first example is the report by the agent Ismor for the Russian army (Figs. 3 and 4).[4]

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[2]Archiv der BBAW, Bestand Preußische Akademie der Wissenschaften, I-XVI-225, sheet 95.
[3]Archiv der BBAW, Bestand Preußische Akademie der Wissenschaften, I-X-8, sheet 84.
[4]Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1447.

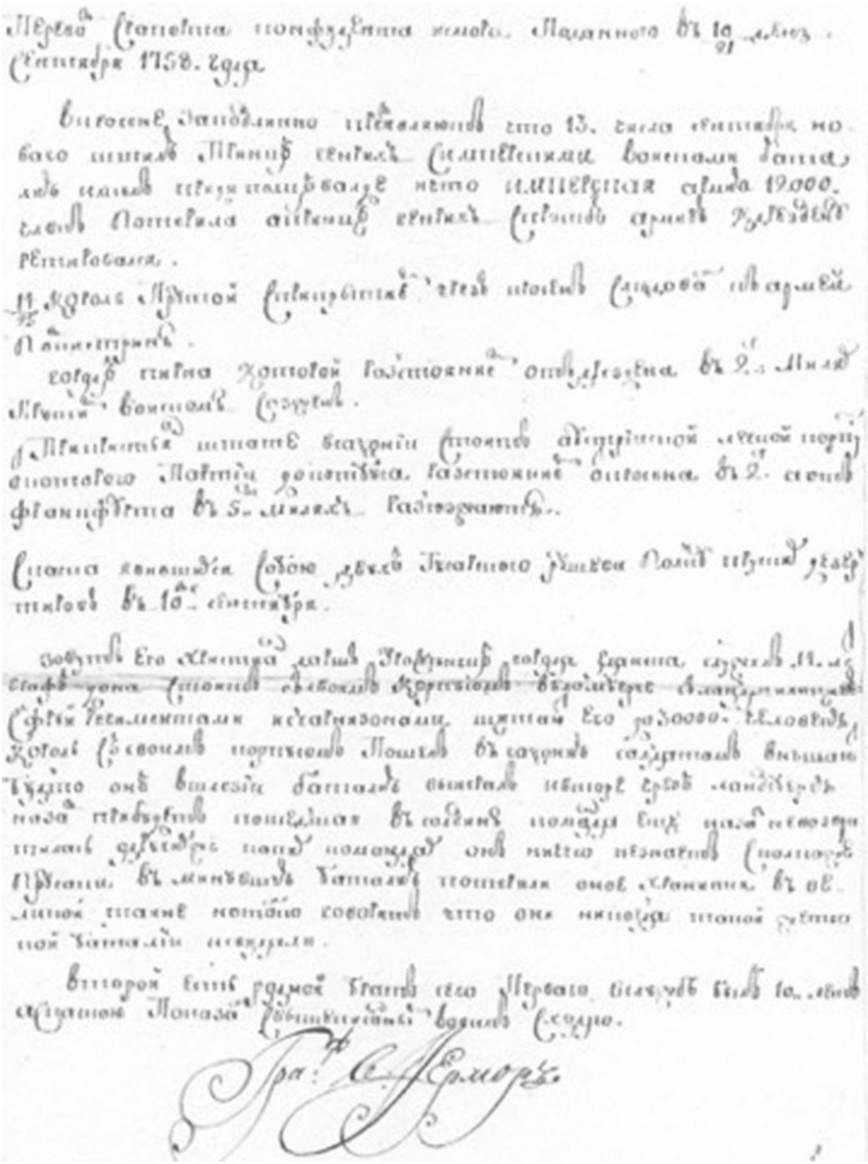


Fig. 3 Russian report of an agent Ismor for the Russian army. Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1447

Ismor's report dates from September 10/21, 1758. It describes a battle by Prince Henry and the activities of King Frederick II before it repeats the statements of two deserters of Joseph Theodor von Ruesch's regiment of "Black Hussars":

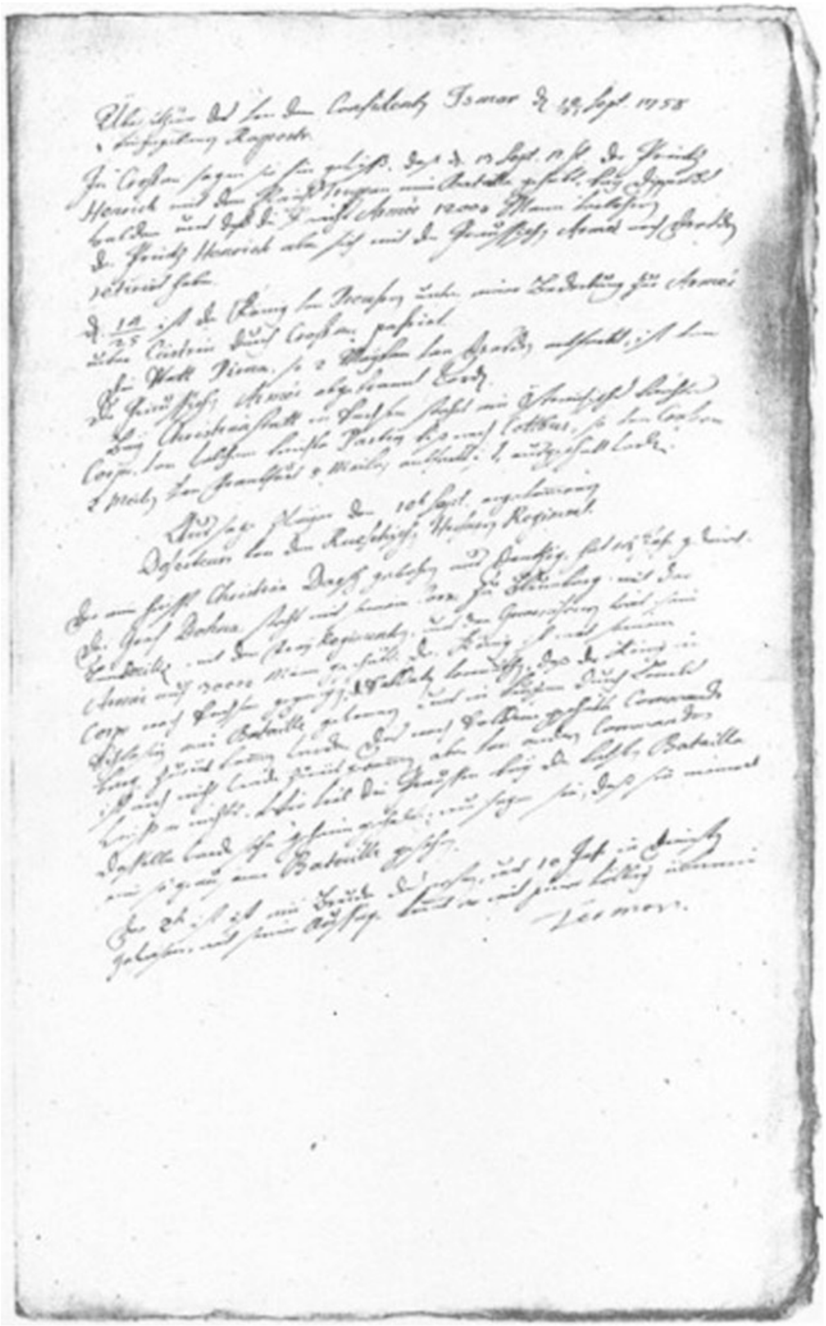
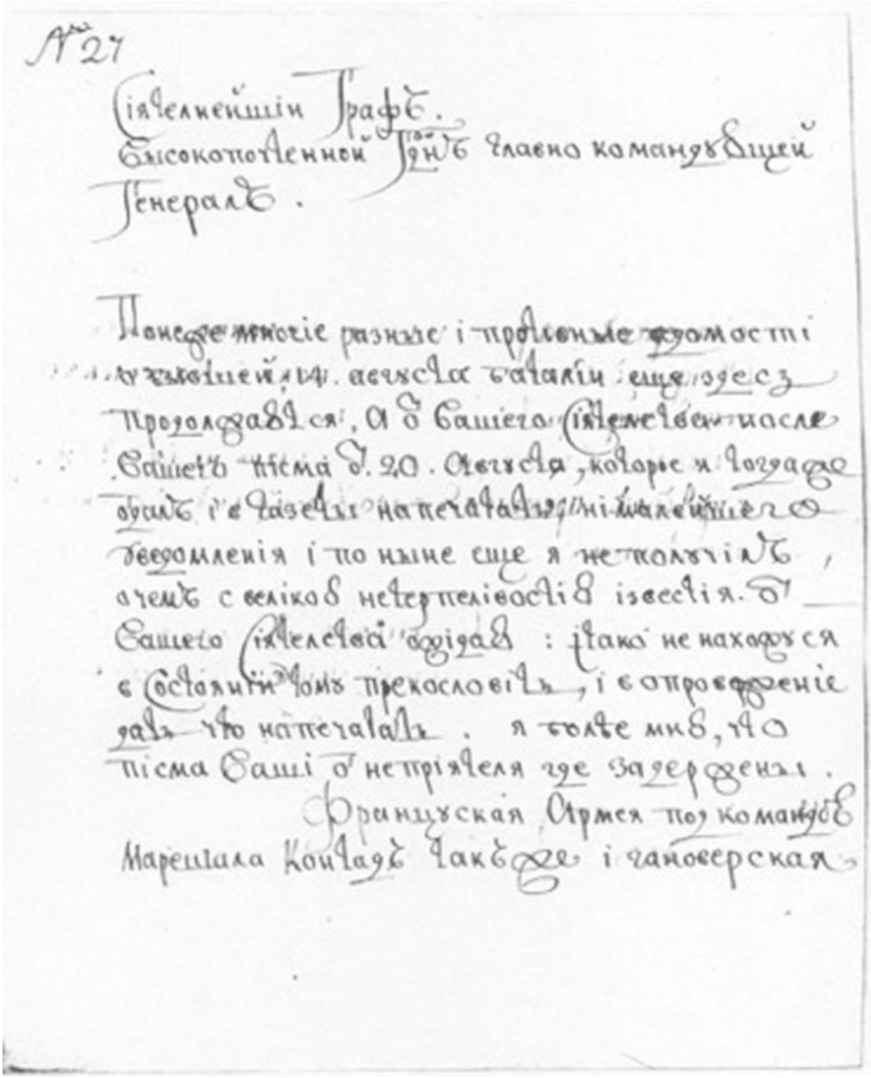


Fig. 4 Euler's German translation of Ismor's report. Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1447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Сиятелнейшии Графъ.
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Генералъ.

Fig. 5 Count Goloffkin's letter to general Fermor. Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1449

Der eine heißt Christian Dorsch gebohren aus Dantzig, hat 14 Jahr gedient. Der Graf Dohna steht mit seinem Corps zu Blumberg, mit der Land Miliz, mit den Frey Regimentern, und den Guarnisonen wird seine Armee auf 30,000 Mann geschätzt etc.

One of them is called Christian Dorsch, born in Danzig (Gdansk), he has served fourteen years. Count Dohna is with his corps at Blumberg. Together with the militia of the country, the free regiments, and the garrisons, his army is estimated to be 30,000 soldiers, etc.

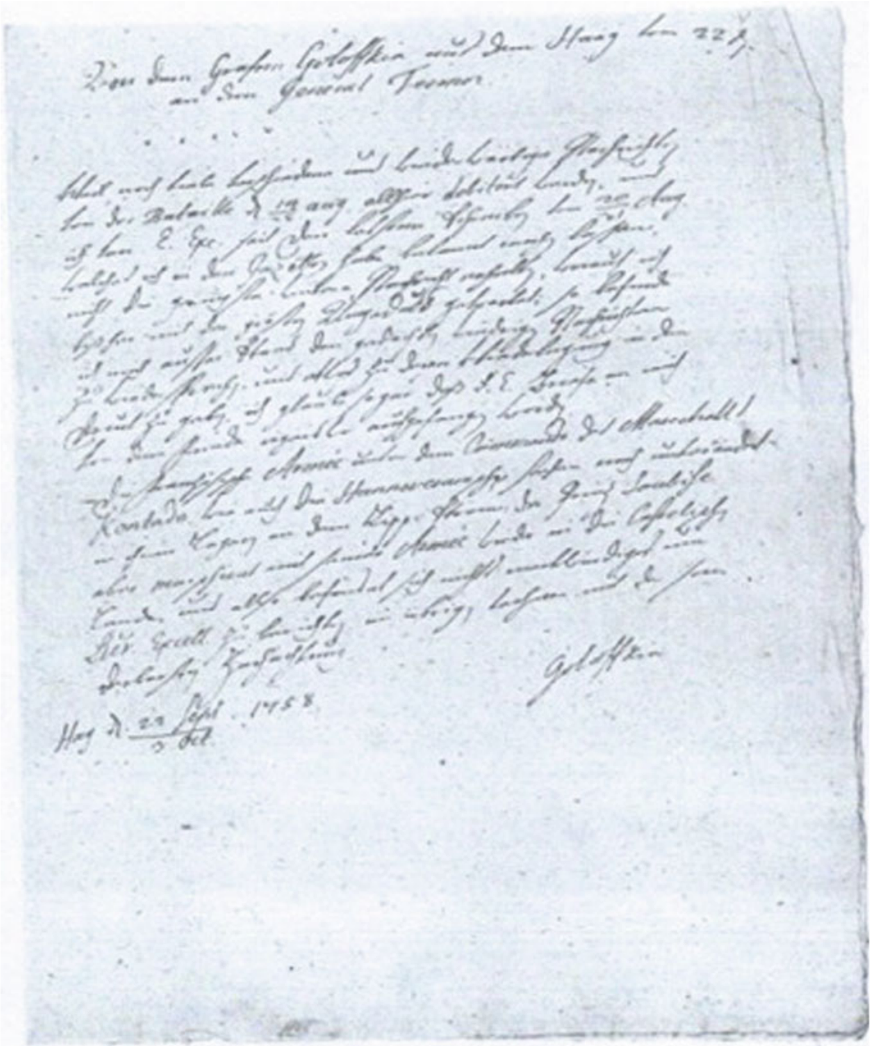

Fig. 6 Euler's German translation of Goloffkin's letter. Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1449

The second example is Count Goloffkin's letter, written in Den Haag, to the Russian general Fermor, dating from September 22, 1758 (Figs. 5 and 6).[5]

Goloffkin expresses his regret that it is difficult to get reliable information about the battle that took place on August 14/25. He believes that Fermor's letters to him have been intercepted by the enemy:

[5]Geheimes Staatsarchiv Preußischer Kulturbesitz, I.HA, Rep. 63 Geheimer Rat, Nr. 1449.

> Die Französische Armee unter dem Commando des Marechalls Kontade wie auch die Hannoveranische stehen noch unverändert in ihren Lagern an dem Lippe Strom etc.

> The French army under the command of marshal Kontade and also the Hanoverian army are still in their camps at the River Lippe, etc.

Euler's Estate

For financial reasons, Euler's large family did not live with him in his house in Berlin, but rather on the estate that he had bought in 1753, which belonged to the small village of Lietzow close to Berlin. Today, it is a part of Berlin's Charlottenburg district. During the Seven Years' War, on October 9, 1760, Russian and Saxon troops temporarily occupied Berlin and plundered the surrounding villages, especially Lietzow, including Euler's estate. The command from the Russian Count Chernishef to spare this estate from plunder came too late (Knobloch 2012).

On October 18, 1760, Euler wrote to the historian Gerhard Friedrich Müller in St. Petersburg, the abiding secretary of the Russian Academy of Sciences since 1754, in order to complain about this robbery and to make a claim for damages (Juškevič; Winter 1961, 161f; Fellmann 2007, 101f). He enumerated the losses:

> I have lost four horses, twelve cows, many head of livestock, a lot of oats and hay. All of the furniture of the house has been ruined. This damage is more than 1100 Imperial Taler according to an exact calculation […] All in all, the damage is at least 1200 roubles.

By chance, Euler's statements about his losses can be checked, because the Mayor of Charlottenburg elaborated a specification of damages for Lietzow and Charlottenburg on October 24, 1760, that has been preserved in the Main Archives of the province of Brandenburg of the Federal Republic of Germany in Potsdam (Fig. 7).

The list consists of nine columns. They enumerate the names of the fifteen families concerned from the village of Lietzow and the robbery of cash currency, rye, barley and oat, hay, horses, cows, pigs and sheep. The fourth line mentions "Professor Euler".

No cash currency; 1 Wispel, 5 Scheffel rye (1 Wispel = 24 Scheffel, 1 Scheffel = 54,73 L; 1 Wispel, 6 Scheffel barley and oat; 30 metric hundred-weight of hay; two horses; thirteen cows; seven pigs; twelve sheep.

The astonished reader will notice at once that Euler has doubled the number of stolen horses. He was indeed amply recompensed by the Russian general and the Russian tsarina Elisabeth. They certainly did not know that Euler had helped the Prussian authorities by translating Russian secret dispatches.

5 Euler's Second Stay in St. Petersburg

By the end of his sojourn in Berlin, Euler's relationship with the Prussian king had worsened to such a degree that he finally decided to accept the invitation of the Empress of Russia, Catherine II the Great, to return to St. Petersburg in 1766

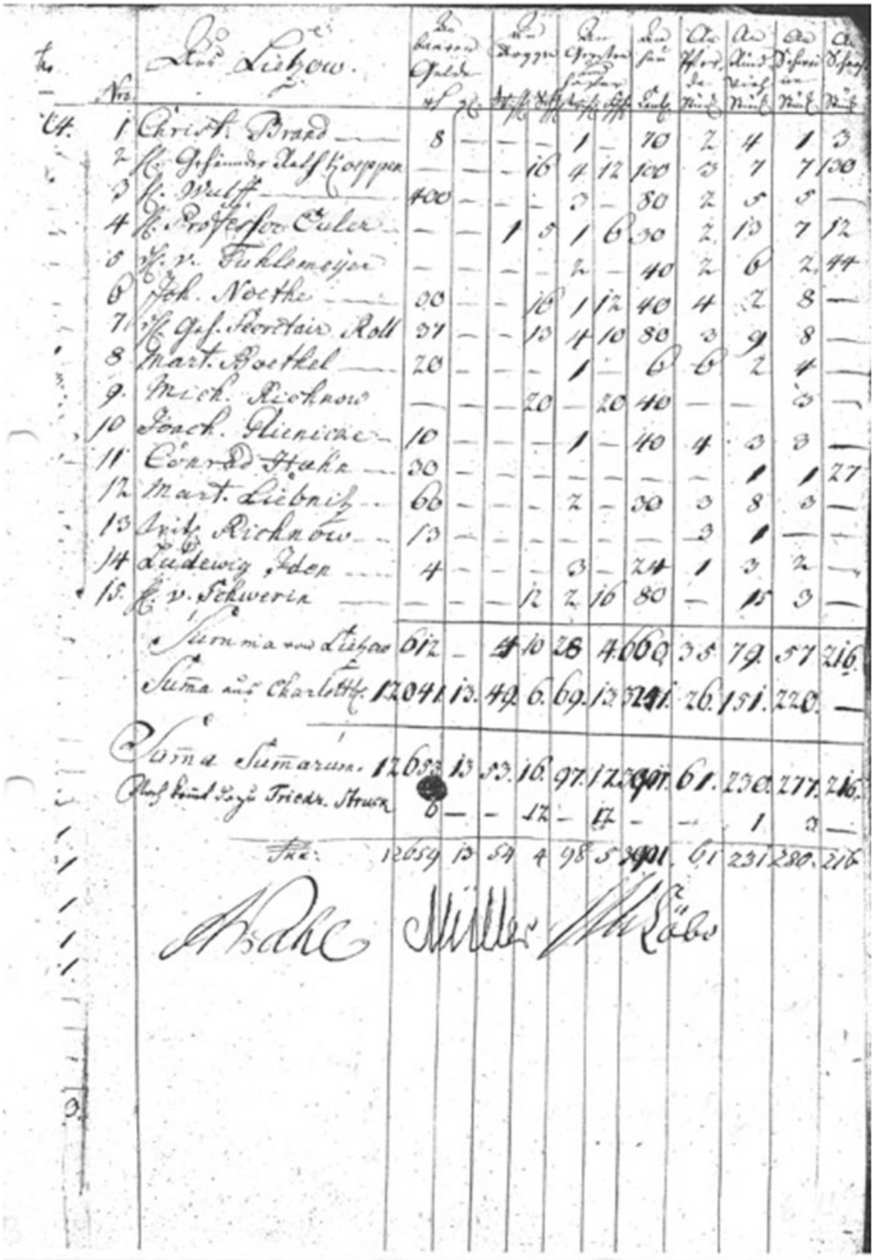

Fig. 7 List of damages regarding the village Lietzow. Brandenburgisches Landeshauptarchiv Potsdam, Rep. 2 Kurmärkische Kriegs- und Domänenkammer Nr. S 3498

(Knobloch 2018, 117). He left Berlin for personal reasons. Thus, he lived in St. Petersburg from July 28, 1766, until his death on September 18, 1783. His scientific production did not suffer from his blindness or age. He published the following four great textbooks during this period (Euler 1769–1771; 1770; 1772; 1773):

Dioptrics, 1769–1771,
Complete introduction to algebra, 1770,
Theory of the motions of the moon dealt with by a new method together with astronomical tables, 1772 (so-called Second lunar theory),
Complete theory of the construction and navigation of ships, 1773 (so-called Second naval theory).

Epilogue

Euler's behaviour as a mathematician can hardly be better characterized than by the words of Eduard Fueter (Fueter 1941, 79; Fellmann 2007, 172):

> For where mathematical reason did not suffice, for Euler began the kingdom of God.

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Lagrange's Mathematical Life in Berlin and Paris. A Reappraisal

Maria Teresa Borgato

Abstract

Lagrange's life was marked by three distinct periods in three European capitals: Turin, Berlin and Paris. Lagrange left Turin, his hometown, due to the lack of prospects for an adequate scientific career. As is well known, his dissatisfaction came to the notice of d'Alembert, who promoted his transfer to Berlin, after Euler's position was vacated at the Academy of Sciences and Letters. After twenty years dedicated to intense research, Lagrange's quiet life in Berlin came to an end with the death of Frederick II of Prussia, so he accepted a position at the Academy of Sciences in Paris. Lagrange's time in Turin has, by now, been well studied and documented, as have the why and wherefore of his transfers. There is also an extensive body of literature on his Parisian period. However, as to his Berlin period, which is well illustrated by his vast scientific production, little is still known as regards his interaction with the Academy and the events of the Prussian court. The main part of this work is dedicated to this period, starting from the end of the Turin period up to his first decade in Paris. The usual representation of a Lagrange engaged exclusively in his mathematical research has undergone a thorough revision.

Keywords

Lagrange · Berlin Academy · Political arithmetic · Widows' pension fund · Charles Messier · Anton Mesmer · Franz Karl Achard · Inedited letters

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1 Introduction

Lagrange's scientific biography has been the subject of numerous detailed studies.[1] More recent works have added remarkable new insights with the publication of many unedited documents.[2]

I will focus mainly on some little known aspects of Lagrange's activity in Berlin, as well as his initial years in Paris, related to some recent discoveries, in particular, to the publication of an important unedited memoir contained in Volume XIV of his manuscripts preserved at the Institut de France.[3]

Lagrange divided his scientific life into three periods, of almost equal length and importance, in Turin, Berlin and Paris. His transfers and his choices were motivated by the need to guarantee himself an adequate economic position and a favorable cultural environment, so as to carry out his research safely and independently. Lagrange did not like to travel or change his lifestyle unless forced to by circumstances.

Lagrange left Turin, his hometown, due to the lack of prospects for an adequate scientific career, traveling to Berlin to fill the post of director of the Academy's mathematics class, which had been vacated by Euler. An in-depth study has been devoted to the events that caused Lagrange to leave his homeland (Taton 1986; Borgato and Pepe 1987, 1989). I should just like to point out that Lagrange was never driven by ambition or desire for change to search out new posts and that, even in this first transfer, he was bound by circumstances. In fact, until the very end, he tried rather to make use of the testimonies of great esteem and regard that he received from d'Alembert and Euler to find a position in his homeland.

When, after the death of the King of Prussia, both the autonomy and the economic treatment that he had enjoyed ceased, he left Berlin for Paris, and was subsequently welcomed by the Academy of Sciences. Since Lagrange had had unpleasant experiences in his relations with the authorities, which determined a behavior of prudent reserve, he avoided exposing himself to questions that were beyond his precise role as a scientist or exceeded the field of his competences. However, this was more a choice induced by political and economic conditions than a personal choice, as will be shown in this work.

From an examination of various documents and letters, the broad spectrum of Lagrange's scientific and cultural interests emerges, but also the sensitivity he showed towards the social sciences and the ideals of the Enlightenment. With the end of his stay in Berlin, a new period opened up for him, one that saw Lagrange

[1]Regarding the oldest historical biographers, I rely on the introductory essay by Luigi Pepe in the reissue of the book by Filippo Bruzio (Pepe 2013). For the chronological list of Lagrange's works, see: (Taton 1974).

[2]On the first period in Turin, see (Taton 1986; Borgato and Pepe 1987), on Lagrange's manuscripts, (Borgato and Pepe 1987, 1988, 1990a), on his family letters, (Borgato and Pepe 1989), on his transfer from Berlin to Paris, (Taton, 1988), and on the French period and his teaching at the Ecole Polytechnique and Ecole Normale, (Phili 1974, 1976, 2008, 2013), (Pepe 1986, 1992).

[3]The memoir is published in (Borgato 2013).

collaborate with the political authorities in technical matters, such as the reform of the system of weights and measures, in the administration of the Mint, in statistical studies on the French population, and in the many reports on the works and projects submitted to the Institut de France.

In conclusion, the contingent political and economic conditions modified, on the one hand, Lagrange's attitude towards society and, on the other, the European scientific landscape as a consequence of the important role he played first in Prussia and then in France.

2 From Turin to Berlin

The first period in Turin is characterized by his teaching at the Artillery School and the foundation of a private society for the development of sciences.

Having begun a promising career in Turin, Lagrange had no plans to leave his hometown. At the early age of 14, he had enrolled in the University of Turin, by 18, he had published his first work, and the following year, he had told Euler of his method for maxima and minima presented in the form of functional integrals. Letters of praise from both Euler and Fagnano were instrumental in his attainment of a post as assistant in the teaching of mathematics at the Royal Artillery School in 1755. Besides participation in teaching, the post of assistant also involved the writing of textbooks for the students, so Lagrange compiled two treatises: one on mechanics and another on "sublime analysis", an introductory text to the former. Only the latter has come down to us and was published for the first time about thirty years ago (Borgato and Pepe 1987, pp. 45–198).

Lagrange made important friendships at the university and the artillery school, particularly with Gianfrancesco Cigna and Angelo Saluzzo, with whom he shared an interest in scientific experimentation. Together, they founded a private society in 1757 aimed at promoting research in the fields of mathematical and natural sciences. The society's membership soon increased, and in less than two years, the first volume of acts and memoirs was published under the title: *Miscellanea Philosophico-Mathematica Societatis Privatae Taurinensis* (1759). Lagrange, in his correspondences with Euler, Maupertuis, d'Alembert and Daniel Bernoulli, not only contributed to its dissemination, but also to bringing it on par with the level of most European academic journals.

Lagrange's fame and the importance of his scientific production grew in the following years, and was further strengthened by the contacts he made, in particular, with d'Alembert, during his stay in Paris between November 1763 and the end of May 1764.

Lagrange's position in his own country, however, became more and more dissatisfactory and his career seemed to offer no prospects for the future. In fact, not only did Lagrange's innovative work not receive due acknowledgement, but it was even strongly opposed at the Artillery School, where the insistence on a rigorous basis for infinitesimal calculus was little appreciated in a school whose teaching goals were more directed towards practical purposes. Thus, the general Director of the Artillery and Fortification Schools, in a document from 1769, remarked that: "The professors of pure theory, however eminent they may be, do not understand the way to apply their doctrines to the demands of war". He also criticised Lagrange's treatises "as being too lofty, metaphysical, and spread over subjects that are far-removed and lacking in application".

Additionally, the private scientific society did not obtain official recognition or funding from political authorities. Lagrange put enormous effort into promoting the society, even participating in activities outside his own sphere of interest; three volumes of memoirs were published containing some of his fundamental contributions on the calculus of variations, vibrating strings, and finite differences. Despite Lagrange continuing to acquire foreign members of great renown like d'Alembert, Monge, Condorcet and Laplace, the private society struggled to attain the prestige in his own country that he was awarded by academies abroad. An initial project for the establishment of the Royal Academy of Sciences in Turin was presented to the King in 1760, and, through support of Prince Vittorio Amedeo, heir to the throne, it obtained the title of Royal Society, but it took another 23 years for the project to achieve its goal and become a Royal Academy with the accompanying financial support.

It is a well-known fact that d'Alembert, who had himself declined an invitation to take up the post in Berlin vacated by Euler upon his return to Russia, recommended Lagrange for the position ("à un grand roi … un grand homme"). The first time d'Alembert proposed this, Lagrange expressed his gratitude, hoping, however, that this prestigious invitation might in some way have improved his chances of a better position in Turin, where the authorities had more or less forgotten about him (March, 1766)[4]:

> Nothing will better be able to draw me from the oblivion in which I am left here than a similar invitation, and, provided I do not seem to have been involved in intrigue, I have no doubt that it will produce a very good effect, either that I will be permitted to go away, or that it is thought expedient to prevent it.

It is of interest to note the comments he makes in his correspondence with d'Alembert concerning the difference in payment that he was offered (six times higher).

D'Alembert to Lagrange, April 26, 1766[5]:

> The King of Prussia has asked me to write to you that, if you want to come to Berlin to occupy a place in the Academy, he will give you a salary of 1,500 écus, which is the equivalent of 6,000 silver livres in France;…

[4] «Rien ne ne serat plus propre à me tirer de l'oublie où l'on me laisse ici qu'une parelle invitation, et, pourvu que je paruisse point l'avoir briguèe, je ne doute pas qu'elle ne prodiuse un très-bon effet, soit qu'on me permette de m'y rendre ou qu'on juge à propos de m'en empêcher.» (*Oeuvres de Lagrange*, XIII, p. 55).

[5] «Le roi de Prusse me charge de vous écrire que, si vous voulez venir à Berlin pour y occuper une place dans l'Académie, il vous donne 1500 écus de pension qui font 6000 livres argent de France;» (*Oeuvres de Lagrange*, XIII, p. 61).

Fig. 1 A Friedrick thaler, 1785 (©Wikipedia/GNU Free Documentation License)

Fig. 2 A specimen of 1766 French silver écu (https://24carat.co.uk/)

Lagrange to d'Alembert, May 14, 1766[6]:

> … for the last ten years I have had only a miserable pension of 259 écus, and I have hitherto been regarded as an entirely useless person…

In Berlin, Lagrange received another 200 *écus* as Director of the Class of Mathematics, 6800 *livres* in total.

The *livre* was a standard monetary unit of account without a specific coin. In France, from 1725 on, one *écu* was a real silver coin corresponding to six livres. D'Alembert is more likely to have been referring to the Prussian currency in use at the time, the *thaler*, whose exchange value was reduced compared to the French *écu* by a factor of about 2/3. The Prussian coin had a fine weight of only 16,704 g of silver (1/14 of the *Cologne mark*, corresponding to 233.856 g) while, in 1766, an exemplar of the French *écu* had the weight of 24,6894 g of fine silver.

3 Lagrange at the Academy of Berlin

After a journey through Europe, with a stay-over in Paris and London, Lagrange arrived in Berlin on October 27, 1766, and officially took possession of his post at the Academy of Science and Letters in Berlin on November 9.

[6]«… n'ai depuis dix ans qu'une misérable pension de 250 écus, et qu'on a regardé jusqu'ici comme une personne entièrement inutile…» (*Oeuvres de Lagrange*, XIII, p. 65).

In spite of the vibrant court life in Berlin, Lagrange lived quietly, taking part only in the engagements expected of him. The court was centered around the strong personality of Frederick II, a great general and statesman, a man with a lively mind and vast culture who loved to surround himself with intellectuals and scientists with whom he engaged daily on equal grounds. Lagrange, aware of the difficulties he had been up against in Turin, did his best to avoid any direct opposition to the bureaucracy of the Berlin Court. Delambre remarks[7]:

> He soon realized that the Germans did not like foreigners to come and take up posts in their country; he began to study their language well; his only serious concern was Mathematics; he was not in anyone's way, because he asked nothing, and soon the Germans were forced to give him their esteem.

As reported by Lagrange:

> The King treated me well, I think he preferred me to Euler, who was a little devout, while I remained alien to any discussion of worship, and did not oppose anyone's opinions.

Lagrange was able to lead a quiet and methodical life in Berlin, which allowed him to give the best of himself in terms of his scientific production: he wrote about eighty memoirs, almost one a month in the early segment of this period, most of which (46) were published in the Berlin Academy's journal, but also in journals in Turin and Paris. His works concerned astronomy and celestial mechanics (Jupiter's system, the problem of the three bodies, the secular equation of the moon, the orbits of comets, and the attraction of spheroids, etc.), earning him five prizes from the Paris Academy of Sciences. Lagrange also carried out other research studies on arithmetic and algebra, resolving important problems of Diophantine analysis and publishing the celebrated memoirs on the resolution of algebraic equations, one of which contains the "Lagrange series", which expresses the roots as a function of the coefficients, and others that bring back the solvability by radicals to the study of the permutations of roots, thus opening the way to Galois' theory. A great many works were devoted to developing the theory of differential equations, above all, those with partial derivatives, by means of which he trusted that almost all phenomena concerning mechanics and hydrodynamics could be expressed. During his period in Berlin, Lagrange wrote most of the first of his greatest treatises, namely, the *Mécanique analytique*, published in 1788, when he had been in Paris for a year, in which all the principles of mechanics are traced back to that of virtual velocities and all mechanics to an application of differential calculus.

[7]«il s'aperçut bientôt que les Allemands n'aiment pas que les étrangers viennent occuper des places dans leur pays; il se mit à bien étudier leur langue; il ne s'occupa sérieusement que de Mathématiques; il ne se trouva sur le chemin de personne, parce qu'il ne demandait rien, et força bientôt les Allemands à lui accorder leur estime. Le Roi me traitait bien, [...] je crois qu'il me préférait à Euler, qui était un peu dévot, tandis que moi je restais étranger à toute discussion sur le culte, et ne contrariais les opinions de personne.» Delambre (1867) p. XXIII.

Lagrange was satisfied with his peaceful and productive life. He had married his cousin, Vittoria Conti, in Berlin and did not intend to move, not even to return to Turin so as to see his father and brothers again[8]:

> The calm and uniform kind of life to which I have become accustomed here takes away all desire to travel and however great it may be for me the pleasure of seeing you and embracing you and my brothers and sister and all friends, I very much doubt I will ever succumb to the temptation to undertake the trip to Turin unless circumstances oblige me in some way, which for now does not seem to me to be the case.

Lagrange supported the Academy, above all, but not only, through his personal research: thanks to his decision to avoid disputes, he was able to mediate among the various components of the academic body, while remaining above the parties. As for the introduction of new members, we note the aggregation, to more than just the mathematics class, of several Italian scientists and scholars: Giovanni Francesco de' Toschi di Fagnano (1772), Lazzaro Spallanzani (1776), Giuseppe Toaldo (1776), Antonio Maria Lorgna (1777), Marsilio Landriani (1783),[9] and Alessandro Volta (1786).[10]

And there were more: Antonio Giuseppe della Torre di Rezzonico (secretary of the Academy of Arts in Parma, 1772), Cristoforo Casati (jurist and historian, 1779), Antonio Scarpa (anatomist, 1780), Carlo Denina (historian, 1782), and Girolamo Lucchesini (diplomat and man of letters, 1786).

At that time, the Academy was divided into four classes: physics or experimental philosophy, mathematics, speculative philosophy, and belles-lettres or philology. The mathematics class, specifically, included geometry, mechanics, and theoretical astronomy. Each class met once a week and the academicians could take part in the work of all sections.

Even in the period between his appointment as a corresponding member (1756) and his arrival in Berlin (1766), there are important entries indicating new Italian members, a group that had previously been almost non-existent: the mathematicians Paolo Frisi (1758), Francesco Maria Zanotti (1760), Eustachio Zanotti (1760), and Giovanni Salvemini di Castiglione (1764), the physician Giovanni Bianchi (1758), the archaeologist Ottavio Antonio Baiardi (1759), and the physiologist Leopoldo Caldani (1760). If we can attribute an openness to and recognition of Italian culture to the influence of Francesco Algarotti, who had, however, left the Berlin court in 1753, we take no risk in acknowledging Lagrange as having indirectly favored and

[8]«Le genre de vie tranquille et uniforme auquel je me suis accoutumé m'ont tout envie de voyager, et quelque grand que pût etre pour moi le plaisir de vous revoir et de vous embrasser ainsi que mes Frères at ma Sœur, et tous mes Amis, je doute fort que je succombe jamais à la tentation d'entreprendre le voyage de Turin a moins que les circonstances ne m'obligent en quelque façon, ce dont je ne vois jusqu'ici nulle apparence.» Lagrange to his father, 26th December 1775 (Borgato-Pepe 1989, pp. 270–271).

[9]Marsilio Landriani (1751–1815), physicist and chemist, Court Marshal of Duke Albert von Sachsen-Teschen in Vienna.

[10]Historische Akademiemitglieder. Mitglieder der Vorgängerakademien der Berlin-Brandenburgischen Akademie der Wissenschaften (https://www.bbaw.de/die-akademie/akademie-historische-aspekte/mitglieder-historisch).

continued this process, both through his fame in the mathematical sciences and the goodness of his character, accompanied by a sort of dissimulation of his superiority.

In 1769, on the recommendation of Lagrange, the astronomer Charles Messier was added to the Academy (see Appendix), as were, later on, the mathematicians Daniel Melander (1773), Condorcet (1786) and Jean-Baptiste Delambre (1787).

On the Berlin side, the mathematicians Johann Carl Gottlieb Schulze (1777) and Georg Friedrich von Tempelhoff (1786) and the astronomer Johann Elert Bode (1786) were added as full members.

However, we must emphasize Lagrange's extreme caution in not irritating the local academic elite with an excessive number of openings for foreigners or personal initiatives that exploited his role as class director. We recall his dissuasive response to d'Alembert, who wanted Laplace to be assigned to the Berlin Academy (January 19, 1773),[11] and his affirmations of not having taken any part in the admission of Carlo Denina (November 2, 1782).[12]

Even if the institutional interventions carried out by Lagrange were never conspicuous, his presence in Berlin was more than commensurate with the loss of Euler, and undoubtedly enhanced the prestige of the Academy.

In 1772, the Class of Mathematics announced its first award, expiring on May 31, 1774, for refining the calculation of the orbits of comets:

> It is a question of perfecting the methods which one uses to calculate the orbits of the Comets according to the Observations; above all to give the general and rigorous formulas

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[11]«Mon cher et illustre ami, pour répondre à la confiance que vous me témoignez dans votre dernière Lettre du 1er janvier, je vais vous dire avec toute la sincérité possible ce que je pense sur l'affaire dont il s'agit. Je suis d'abord très-convaincu que l'Académie ferait une excellente acquisition dans la personne dont vous me parlez; cette acquisition serait même d'autant plus importante pour elle, que la Classe de Mathématiques est très-mince, n'étant composée que de MM. de Castillon, Bernoulli et moi; ainsi vous jugez bien que je serais très-charmé et flatté de pouvoir contribuer en quelque manière à rendre ce service à l'Académie et à ma Classe en particulier. Mais 1° je suis bien éloigné de croire que j'aie auprès du Roi le crédit nécessaire pour faire réussir une pareille affaire, et je craindrais même qu'il ne trouvât mauvais que je prisse la liberté de lui en écrire; 2° je doute fort que l'Académie voulût faire, à ma réquisition, quelque démarche pour cela auprès de Sa Majesté, car je ne pourrais guère compter sur les voix des membres de ma Classe, et encore moins sur celles des autres; d'ailleurs je ne regarde pas sa recommandation comme fort efficace, puisque, une seule fois qu'elle s'est hasardée à proposer au Roi quelques sujets pour la Classe de Philosophie, elle n'a reçu aucune réponse. Tout bien considéré, je crois que le mieux ce sera que vous proposiez vous-même directement et immédiatement à Sa Majesté la personne en question. Si elle est acceptée, l'affaire est faite, et l'Académie recevra ordre de la mettre au nombre de ses membres et de lui assigner la pension sur sa caisse c'est de quoi j'ai déjà vu plusieurs exemples. Je vous conseillerais même de ne faire aucune mention de moi dans la Lettre que vous écrirez au Roi dans cet objet, et cela pour éviter tout air de cabale, qui ne pourrait que nuire au succès de l'affaire. […]» (*Oeuvres de Lagrange*, XIII, pp. 256–257).

[12]«Je viens d'acquérir pour confrère un de mes compatriotes et amis, l'abbé Denina, connu par plusieurs bons Ouvrages italiens, et surtout par ses *Révolutions d'Italie*. Le Roi l'a fait venir de Turin à la recommandation du marquis de Lucchesini qui l'avait beaucoup vu en Italie, et, quoique l'Académie, dans l'état où elle est, ait peut-être plus besoin de savants que de littérateurs, elle ne peut néanmoins que se féliciter de cette acquisition. Pour moi, qui n'y ai eu aucune part ni directe ni indirecte, j'en profiterai d'autant mieux.» (*Oeuvres de Lagrange*, XIII, p. 375).

> which contain the solution to the Problem of determining the parabolic orbit of a Comet by means of three observations and to show the use of them to solve this problem in the simplest and most exact way.[13]

The award was shared by Georg Friedrich von Tempelhoff and Johann Heinrich Lambert.[14] The state of research from which the theme of the competition originated is described by Lagrange himself in the first of three memoirs with the same title: *Sur le problème de la détermination des orbites des comètes d'après trois observations*.[15] The problem of determining the orbit of a comet from three observations was first addressed and solved by Newton. Subsequently, several important mathematicians had tried to perfect his methods, only managing to vary and simplify some aspects of them, without, however, making them more precise and more convenient for practice. After describing the mathematical problem and Newton's method, Lagrange analyzes and compares the procedures developed up to then by Bouguer (1733), Euler (1744) and Lambert (1761, 1771). Finally, he points out how Lambert's method had been perfected by Tempelhoff in the essay submitted for the academy prize. Lagrange concluded that, although the award-winning memoirs, along with those that had received a mention, had helped to shed new light on the problem, several questions remained to be explored, and this was to be the subject of his second memoir.[16]

Subsequent researches by Dionis du Séjour and Laplace (1779, 1780) on the same topic prompted Lagrange to write a third memoir so as to give a more direct and general method.

Lagrange's most significant intervention, however, was the proposal for the institution of an award for the year 1784 (expiring on January 1, 1786), devoted to the foundations of infinitesimal calculus, which, even if it did not bring about a completely satisfactory result, did, however, herald the synthesis of the *Théorie des Fonctions Analytiques*[17]:

[13]«Il s'agit de perfectionner les méthodes qu'on emploie pour calculer les orbites des Comètes d'après les Observations; de donner surtout les formules générales et rigoureuses qui renferment la solution du Problème ou il s'agit de déterminer l'orbite parabolique d'une Comète par le moyen de trois observations et d'en faire voir l'usage pour résoudre ce problème de la maniéré la plus simple et la plus exacte.» *Nouveaux Mémoires de l'Académie de Berlin année 1772* (1774). Berlin, Voss, p. 20.

[14]Members and award winners of the Berlin Academy in (Hartkopf 1992).

[15]Lagrange (1778–1783).

[16]«Quoique les deux Pièces couronnées et celles qui ont eu l'accessit aient répandu beaucoup de nouvelles lumières sur cette question, il paraît néanmoins qu'elle n'y a pas été envisagée sous le point de vue dont je viens de parler, et qu'on peut à cet égard la traiter encore comme un sujet entièrement nouveau; ce sera l'objet d'un autre Mémoire.»

[17]«On demande *Une théorie claire & précise de ce qu'on appelle Infini en Mathématique*. On sait que la haute Géométrie fait un usage continuel des *infiniment grands* & des *infiniment petits*. Cependant les Géomètres, & même les Analystes anciens, ont évité soigneusement tout ce qui approche de l'infini; & de grands Analystes modernes avouent que les termes *grandeur infinie* sont contradictoires. L'Académie souhaite donc qu'on explique comment on a déduit tant de théorèmes vrais d'une supposition contradictoire, & qu'on indique un principe sûr, clair, en un mot vraiment mathématique, propre à être substitué à l'*Infini*, sans rendre trop difficiles, ou trop longues, les recherches qu'on expédie par ce moyen. On exige que cette matière soit traitée avec toute la

> We are asking for *A clear and precise theory of what is called Infinity in Mathematics*. We know that high geometry makes continual use of the *infinitely large* and the *infinitely small*. However the Geometers, and even the ancient Analysts, have carefully avoided anything that approaches infinity; and great modern Analysts admit that the terms *infinite magnitude* are contradictory. The Academy therefore wishes it to be explained how so many true theorems have been deduced from a contradictory supposition, and that a sure, clear, in a word truly mathematical principle, should be indicated as suitable to be substituted for *Infinity*, without making the research which is started by this means too difficult, or too long. We demand that this matter be treated with all possible generality, rigor, clarity and simplicity.

The competition was open to scholars from all countries, excluding members of the Academy itself, and the prize consisted of a gold medal worth 50 ducats. Contributions had to be anonymous, but marked with a motto, accompanied by a sealed note with personal data. Twenty-three memoirs arrived, none of which, in the opinion of the commission, had complied with the requests for clarity, simplicity and rigor of the announcement, and most of which had dealt only with the infinitesimal calculus, in which the principle requested also had to be applied to algebra and geometry.

The academy awarded the prize to the memoir that, despite not achieving the objectives, came closest (defined by Lagrange as «le meilleur d'un mauvais lot»). It was entitled *L'Infini, est le gouffre ou s'absorbent nos pensée*, and was written by the Swiss mathematician Simon Lhuilier. A mention was also reserved for *Peritia sit mihi amor*, the author of which is still unknown. Among the non-awarded essays, one was identified by A. P. Yushkevich as belonging to Lazare Carnot.[18]

Lagrange's role in the management of these competitions was central, but he did not like to stand out, and his name appears in the official documents of the Academy only infrequently. However, his contribution to academic life did not go without notice. In support of this statement, we are now publishing, in the appendix, three surviving documents preserved in the Archive of the Academy. They testify to the wide range of Lagrange's interests, not limited to the mathematical sphere. The first of these is a letter to Frederick II, with a proposal to procure the skilled observational astronomer Charles Messier (1730–1817), who had already observed several comets at the Naval observatory in Paris and later identified a large number of unknown celestial bodies. Messier was aggregated that same year, 1769. One of the main themes of theoretical astronomical research at that time was the determination of the orbits of comets starting from observations, and Lagrange's intervention was most likely related to the prize that he proposed in 1772.

The second document in the appendix is Lagrange's opinion on a work[19] that had just been published by a famous physician who was active at that time in Vienna, Anton Mesmer (1734–1815). Mesmer believed that he had discovered

généralité, & avec toute la rigueur, la clarté & la simplicité possibles.». *Nouveaux Mémoires de l'Académie de Berlin Année 1784* (1786). Berlin, Decker, pp. 12–13. *Ib. Année 1786* (1788) p. 9. The matters involved in this award have been studied in (Grabiner 2005).

[18]On these essays and Carnot's contribution to the metaphysics of infinitesimal calculus, see (Youschkevitch 1971).

[19]Mesmer (1775).

extraordinary influences of animal magnetism in the treatment of various diseases. Lagrange's opinion is cautiously negative. He observed that others attributed influences to electricity that, for Mesmer, were due to magnetism. The claim of enclosing magnetic fluid in bottles was also reminiscent, in this case, of the Leyden jar. Finally, he observed that Mesmer did not give details of the procedures he had followed in his studies, and asked that the latter disclose the details of his experiments, only one of which would go on to make him the greatest celebrity in the medical world. Lagrange therefore anticipated the judgments on animal magnetism given by the Académie des Sciences in Paris, where Mesmer moved in 1778.

The third document is a letter from Lagrange to the director of the philological class, Jean Bernard Mérian (1723–1807), concerning the proposal to admit the young scholar Franz Karl Achard (1753-1821), favored by Frederick II and a pupil of Andreas Sigismund Marggraf (1709–1782). Lagrange seems to have been perplexed, and wanted assurance from Johann Georg Sulzer (1720–1779), who had been director of the philosophy class in Berlin since 1775. At that time, Achard only dealt with chemistry, but after joining the Academy in 1776, he became the director of the physics class. Achard is known for numerous studies, including a number of practical interests, such as the extraction of sugar from beets.

4 The Prussian Widows' Pension Fund and the Conflict with the Minister

Only in one case did Lagrange allow himself to be diverted from his usual caution regarding politics, when he became involved in a dispute with the authorities over a very delicate matter.

Despite his quiet life and dedication to scientific study in Berlin, Lagrange showed great interest in the applications of mathematics to human sciences. This became evident a few years after his arrival in Berlin regarding a public fund established by the Prussian government in favour of widows, a question over which he could not avoid coming into conflict with Minister von der Schulenburg. In this case (the only one we know of), Lagrange faced the authorities with determination.

The German Protestant countries were the first in Europe, and the world, to establish public bodies providing insurance policies for widows, and on December 28, 1775, the rules and regulations of an insurance institute for widows, supported by some ministers and, in particular, by von der Schulenburg,[20] were published in Berlin.

The Prussian Institute for assistance to widows was a public bank through which a husband could insure his wife, in case of his death, with a life annuity of 25 thalers, or any multiple of this sum up to a maximum of 1000 thalers. In exchange, he accepted the following conditions:

[20]Alexander Friedrich Georg von der Schulenburg-Blumberg (1745–1790).

- an immediate payment proportional to the annuity and related to both his age and that of his wife. This sum would be given back to him or to his heirs should the marriage come to an end, for reason of death or divorce.
- a yearly payment, as long as the marriage lasts, of a fixed sum, again proportional to the annuity and related to his age and that of his wife.

The rules of the institute contain tables reporting the values of the initial sum and the annual contribution for a pension of 25 thalers, corresponding to the age of both the husband, from 20 to 60 years, and the wife, from 13 to 90 years.

This plan came from a modification of a study that Euler had previously been requested to carry out, one that was not, however, published until after his return to St. Petersburg (Euler 1770). Insurance policies were a delicate matter, and in Germany, various cases of bankruptcy had occurred in insurance institutes as well, the most famous one being the Calenberg, in the principality of Hannover. In Prussia, too, there had been an attempt to create a fund for widows of state employees. Contrastingly, this new pension fund was open to any citizen who could afford an insurance policy. Great precision was thus required to balance the revenue and expenditure, by means of an accurate calculation of the probabilities of survival of the insurer (husband) and the beneficiary (wife). For this reason, mortality tables of the population involved were required.

Lagrange examined the rules of the Prussian fund and expressed his criticisms to some of the Academy members. As he was urged to carry out further research, he developed a study based on the calculus of probabilities, and read a memoir, *Sur les rentes viagères* (On life annuities), before the Academy of Sciences of Berlin on February 22, 1776.

By leaving aside some conditions referring to particular cases, which could not be treated mathematically, the problem was expressed as follows:

A certain person A, aged α, wants to settle a life annuity equal to r, on another person B, aged β, to be enjoyed only after the death of A should B survive the former. To this end, A offers, in exchange:

1. To make an immediate payment of a given sum p, on condition that it be given back to him or his heirs upon the death of A or B.
2. To pay an annual sum q during the contemporaneous lives of A and B.

The question was whether this contract might be of advantage or disadvantage to A.

Lagrange solved the problem in three different ways, arriving at the same solution each time. He made use of the concepts and notations introduced by Euler, extended their application (*expérance totale*) and, in the third solution, transformed the problem, with a change of variables, into an equivalent and standard one for the calculus of annuities[21]

[21]See: (Borgato 2013). The annual interest is assumed to be equal to 1 over n.

An individual A, aged α, wants to provide a life annuity of an annual sum r in favour of B, aged β, in exchange for an annual payment of $\frac{p}{n+1}+q+r$, during the contemporaneous lives of A and B.

On the basis of the mortality tables of both Simpson and Deparcieux, Lagrange demonstrated that the insured party was always at an advantage, and the younger the insured party, the greater the advantage.

In the conclusion of this memoir, he predicted that the institution, which had to pay the pensions and collect the installments, would have ended up bankrupt, thus contradicting von Schulenburg's project. Lagrange had to defend his position against the minister, who complained that, instead of publishing the report, he should have sent it to the government.

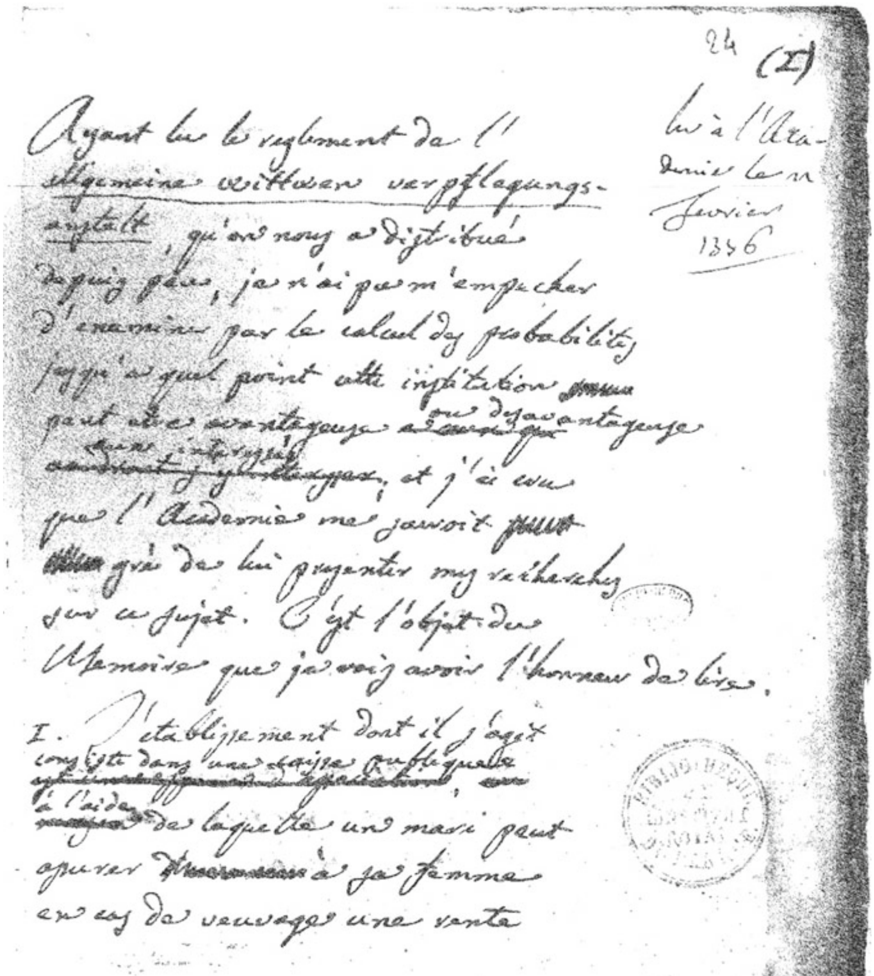
We have the testimony of Dieudonné Thiebault on their confrontation, in which Lagrange held out against the minister with unusual determination. Lagrange retorted, firstly, that he had not, in fact, published it, but had merely wished to warn his colleagues of the risk that they would have encountered had they become involved in the project, and, secondly, that he had not been employed to follow the orders of ministers and that he was under no obligation to be kept waiting by them to offer services that were not required of him, but rather that it was their responsibility to consult whomever they deemed competent. Finally, he felt that their rebuke was unmerited, since they had not turned to him for advice.[22]

Eighteenth century dictates expected the exercise of discretion regarding the widows' funds, much in the same way that the public administration did, to such an extent that the employees were held to professional secrecy. All the more so for this type of fund, which was based on continuous recruitment and for which negative publicity was likely to produce panic and consequent bankruptcy.

In the end, the memoir was not published and remained among Lagrange's manuscripts preserved in the *Institut de France*, where I found and published it some years ago.

Thus, Lagrange's paper only circulated in the form of a manuscript, and among a limited circle of scholars.

[22]«Jamais il n'a été accessible à aucune sorte d'intrigue ou d'esprit de partie; et si quelques fois il y a eu des légères divisions dans l'académie, il y a toujours été étranger, et même il y a paru les ignorer. Ce n'est pas qu'on pût l'intimider. Je me souviens que M. le ministre de Sc***, homme d'esprit, mais vif et accusé de fierté, ayant faite adopter au roi un projet d'une caisse pour les veuves, et M. de la Grange nous ayant lu à l'académie un Mémoire où il démontroit que cette caisse finiroit nécessairement par une banqueroute assez prompte, le ministre fit dire à l'académicien, qu'au lieu de publier ce Mémoire, il auroit dû le remettre au gouvernement; sur quoi le dernier répondit, 1°. qu'il n'avoit point rendu son Mémoire public, et qu'il s'etoit contenté de remplir un devoir d'amitié, en avertissant ses confrères du danger qu'il y auroit pour eux à s'intéresser à ce projet; et 2°. que n'ayant pas été engagé pour être aux ordres des ministres, il ne se croyoit point tenu d'aller faire antichambre chez eux, pour leur offrir des lumières qu'ils ne lui demandoient pas que c'étoit à eux à choisir les personnes auxquelles ils vouloient s'en rapporter pour les calculs dont ils avoient besoin et qu'enfin il ne pouvoit mériter aucune reproche, tant qu'on n'avoit pas recours a lui. Cette réponse modérée, autant que ferme et juste, reduisit M. de SC*** au silence.» (Thiébault 1804) pp. 40–41.


Ayant lu le reglement de l'Allgemeine Wittwen verpflegungs-anstalt, qu'on nous a distribué depuis peu, je n'ai pu m'empecher d'examiner par le calcul des probabilités jusqu'à quel point cette institution peut être avantageuse ou desavantageuse aux interessés, et j'ai cru que l'Academie me sauroit gré de lui presenter mes recherches sur ce sujet. C'est l'objet du Memoire que je vais avoir l'honneur de lire.

I. L'etablissement dont il s'agit consiste dans une caisse à l'aide de laquelle un mari peut assurer à sa femme en cas de veuvage une rente

Fig. 3 J.J. Lagrange, *Solution d'un problème sur les rentes viagères*, Incipit. Bibliothèque de l'Institut de France, c. 23r

In fact, we have a document that testifies to the recipients of Lagrange's writing. Lagrange definitely sent it to the academician Louis de Beausobre[23] on April 14, 1776, because he had asked for it for a friend of his. Beausobre reassured Lagrange of his discretion in the matter.[24]

Lagrange's criticisms, however, resonated within the academic sphere, and were taken up by Augustin Kritter, who, in the same year, 1776, sent von der Schulenburg a study on the project of widows' assistance, in which he foresaw failure within 7 or, at most, 10 years. He then published a paper in Hamburg with the mathematical calculations for this prediction.[25]

Lagrange also wrote another essay during his time in Berlin on a similar theme regarding social security, precisely, on annuities for orphans up to majority age, a paper that he read at the Academy of Berlin on March 8, 1781. It is representative of a situation in which a father wants to insure his children in the event of his death, with an income up to the age of the youngest child.

In this case, it was not a problem of whole life insurance, but of term life insurance, which is even more complicated in that it depends on the life expectancy of two or even more lives. He developed an original approach; however, he avoided publishing it for many years, and this memoir appeared only in 1798 in the *Mémoires de l'Académie de Berlin*, when Lagrange had already been in Paris for eleven years.[26]

> *On a question concerning annuities* (read on 8th March, 1781)
>
> I. We ask for the present value of an annuity constituted on one or more persons whose ages are given, but in such a way that it should not begin until after the death of another person whose age is also given, and must cease as soon as all the persons on whose head the annuity is constituted have passed a given age.
>
> To get a clearer idea of the state of this question, we need only suppose a Father who would like to acquire for his children a certain annual pension payable only after his death until the youngest of the children has reached a given age, for example that of majority, it is a question of determining the sum that he should give to buy such an annuity, assuming as given the age of the Father, and the number and ages of the children.[27]

[23](Louis de Beausobre) Ludwig von Beausobre (1730–1783), philosopher, historian, had been joined to the Prussian Academy on February 2, 1755. His scientific work also concerned politics and finances; in particular, he wrote an introduction to political arithmetic (statistics) (Beausobre 1764). His eulogy can be found in *Nouveau Mémoires de l'Académie* 1784, pp. 52–56.

[24]«M. de la Grange pourroit-il me communiquer son Memoire sur l'Etablissement pour le fond des veuves. Un de mes amis voudroit le lire: je lui reponds qu'il ne s'agit pas de le copier, ni d'en faire un extrait, ou d'en communiquer quelques idées au public: je sais trop ce que les gens de lettres se doivent pour risquer de demander quelque chose qui puisse par la suite causer quelques regrets à M. de la Grange.» Bibliothèque de l'Institut de France, ms 916, c. 76 r. (*Oeuvres de Lagrange*, XIV, p. 273).

[25]Kritter (1777).

[26]Lagrange (1792–1793).

[27]«*Sur une question concernant les annuités* (lu le 8 mars 1781). 1. On demande la valeur presente d'une annuité constituée sur une ou plusieurs personnes dont les ages sont donnés, mais de manière qu'elle ne doive commencer qu'après la mort d'une autre personne dont l'age est aussi donné, et doive cesser dès que toutes les personnes sur la tete desquelles l'annuité est constituée auront passé un age donné. Pour se faire une idée plus nette de l'état de cette question il n'y a qu'à

That mishap reaffirmed Lagrange in his cautious discretion towards political authorities and his professional contacts in general, avoiding any argument that could cause conflict, as can be seen from a letter to a friend in Turin in which he explained, with a certain disenchantment, his philosophy of life. Lagrange intervened in the vicissitudes of another friend of his from Turin, Carlo Denina, who, from some points of view, had a similar fate to his: being forced to leave Piedmont, he was welcomed by the Science Academy of Berlin, and then moved to Paris in the latter part of his life.

Denina was a historian and man of letters, an author of works on economics and politics that had provoked polemics and bad feeling among the authorities of the House of Savoy and the hierarchy of the clergy. At the end of 1777, the printing of one of his works was halted, namely, "Dell'impiego delle persone" and all its copies were destroyed. In this work, Denina presented a radical model of society in which everyone (nobles, priests, monks and nuns included) had to work to contribute to the public and private prosperity. Denina was sent into exile for some time, far from Turin. He also lost his position as professor at the university. At the end of September 1782, Denina was welcomed at the Prussian court of Frederick II. In celebration of the kingdom and the King, he wrote the three-volume "La Prusse littéraire", in which he described the most famous intellectuals who had lived in Prussia between 1740 and 1786, as well as providing us with a portrait of Lagrange and details of his life in Turin and Berlin.[28]

In a letter dated July 11, 1778, from Berlin, to G. A. M. Boccardi,[29] Lagrange expressed his regret about the vicissitudes of his friend Denina, whom he loved and held in high regard, but he also distanced himself from what he considered polemical works devoid of true scientific value. Lagrange was sorry that Denina had not continued his work as a historian, as it had given him great satisfaction. He made a comparison with Galileo, whose true worth, he said, derived from his discovery of the laws of motion and the satellites of Jupiter, whereas the *Dialoghi*, to which he owed his downfall, paled in comparison to his other work. He concluded by affirming his newfound cynicism: he had previously been greatly

supposer un Pere qui voudrait acquérir pour ses enfans une certaine rente annuelle payable seulement après sa mort jusqu'à ce que le plus jeune des enfans ait atteint un age donné par exemple celui de la majorité, il s'agit de déterminer la somme qu'il devroit donner pour acheter une pareille rente, en supposant l'age du Pere, et le nombre et les ages des enfans donnés». Bibliothèque de l'Institut de France. Ms 916, c. 74 (Borgato 2013, p. 26).

[28]Denina (1790–1791). On Lagrange, see, in particular, vol. 2 pp. 140–147.

[29]Giuseppe Antonio Maria Boccardi (1730–1793), poet and man of letters, is the author of an epistle in verse dedicated to Lagrange, to whom he read it the evening before Lagrange's departure for Berlin (August 20, 1766). The laudatory epistle was then published by Francesco Maria Zanotti in Bologna: *Al chiarissimo sig. Luigi De La Grange torinese, direttore della Classe Matematica nella Reale Accademia delle Scienze e Belle Lettere di Berlino. Epistola di un suo Concittadino, ed Amico*. Bologna, Lelio della Volpe, 1767. Boccardi was the director of the prints of the Academy of Sciences of Turin, and a member of other academies of arts and letters, in particular, of the Accademia della Crusca. In civil life, Boccardi was a lawyer and director of the post office in Turin; in this capacity, he acted as an intermediary between Lagrange and his family, and as an attorney, he took care of Lagrange's financial interests in Turin. See Lagrange's letters to his father and his brothers, Carlo and Michele (Borgato and Pepe 1989).

troubled by the harsh treatment often aimed at the intelligentsia, but the society in which he lived, the time and the tenor of it, had fundamentally changed him, both his own manner and the perspective from which he looked at the world.[30]

> I am very sorry for the inconvenience our friend Denina has just had, whom I love and greatly esteem. I hope that consideration will be given to his merit and the honor he gives to his country; but what I hardly dare to hope for is that he will be able to correct himself from that little carelessness which, in a country such as yours, does not fail to cause great harm. I believe that, in general, one of the first principles that every wise man should have is to strictly abide by the laws of the country in which he lives, even if they may be unreasonable. Moreover, I have always observed that, in general, the Works, which have attracted the most contradictions and annoyances to their authors, were not those which were most suited to acquiring them a solid reputation, witness the Encyclopédie and several other French and even Italian works. Our great Galileo owes his true glory only to his discoveries on the movement and on the satellites of Jupiter. His famous Dialogues, to which he owed all his misfortunes, are the least worthy of all his works, and one can no longer sustain reading them. Without them, he would have lived happier, and perhaps would have become even greater by other discoveries. I bet that our friend's new work, from which he has only sorrows, is well beneath his History of Italy, which has produced nothing but satisfaction. Why does he not practice in the career of History, where he has already had so much success? This is the part of Literature that I value the most, and where there is the least danger, as long as we want to adopt the motto that every historian should adopt: *sine ira et studio*. I was once, more than anyone, infatuated with these pettinesses, and irritated by the persecutions to which I often saw men of letters exposed, but I assure you that I am very disillusioned. The age and perhaps even more the climate in which I live gave me a composure that I did not have, and which now makes me see many things under a different aspect than that in which I was accustomed to seeing them.

[30]«Je suis bien fâché du désagrément que vient d'avoir notre ami Denina, que j'aime et que j'estime infiniment. J'espère qu'on aura égard à son mérite et à l'honneur qu'il fait à sa patrie; mais ce que je n'espère presque pas, c'est qu'il puisse se corriger de ces petites étourderies, qui, dans un pays tel que le vôtre, ne laissent pas de faire beaucoup de mal. Je crois que, en général, un des premiers principes que doit avoir tout homme sage, c'est de se conformer strictement aux lois du pays dans lequel il vit, quand même il y en aurait de déraisonnables. D'ailleurs, j'ai toujours observé que, en général, les Ouvrages, qui ont attiré le plus de contradictions et de tracasseries à leurs auteurs, n'étaient pas ceux qui étaient les plus propres à leur acquérir une réputation solide, témoin l'Encyclopédie et plusieurs autres Ouvrages français et même italiens. Notre grand Galilée ne doit sa vraie gloire qu'à ses découvertes sur le mouvement et sur les satellites dé Jupiter. Ses fameux Dialogues, auxquels il a dû tous ses malheurs, sont le moins bon de tous ses Ouvrages, et l'on n'en peut plus soutenir la lecture. Sans eux, il aurait vécu plus heureux, et serait peut-être devenu encore plus grand par d'autres découvertes. Je gage que le nouvel Ouvrage de notre ami, dont il n'a que du chagrin, est bien audessous de son Histoire d'Italie, qui ne lui a produit que de la satisfaction. Que ne s'exerce-t-il dans la carrière de l'Histoire, où il a déjà eu tant de succès? C'est la partie de la Littérature que j'estime le plus, et où il y a le moins de danger, pourvu qu'on veuille adopter la devise que devrait prendre tout historien: sine ira et studio. J'ai été autrefois plus que personne entiché de ces petitesses, et irrité des persécutions auxquelles je voyais souvent les gens de lettres exposés mais je vous assure que j'en suis bien désabusé. L'âge et peut-être plus encore le climat où je vis m'ont donné un sang-froid que je n'avais pas, et qui me fait voir maintenant bien des choses sous un autre aspect que celui où j'avais coutume de les voir». (*Oeuvres de Lagrange,* XIV, 274–275).

In another letter (to the same recipient), dated January 19, 1779, Lagrange was even more explicit, saying that it is inexcusable for a person, after forty years, to have neither come to understand nor adapt to the country in which he lives.[31]

> I feel truly sorry for our friend Denina, but he can hardly be excused for not having got to know the country he lives in after forty years; I consider this to be vital knowledge that every wise man should attain in order to regulate his life. Here one is not molested over books, but over the material; elsewhere over other things. Whatever one say it seems to me that freedom is more or less the same everywhere (I mean personal freedom, which is the only true one), the only difference consists of the things which refer to it. On the other hand, the fields of science and literature are vast enough to be able to achieve fame without annoying religion or the government, and consequently to avoid exposing oneself to risks.

5 Leaving Berlin for Paris

The events that led Lagrange to emigrate for a second time have been investigated, particularly by René Taton, with the publication of many documents coming from the French Diplomatic Archives and the Archives of the Berlin Academy (Taton 1988). In this case, too, it was not a decision dictated by a desire for change, since Lagrange was reluctant to change his life (quite the opposite). Indeed, he foresaw, circumstances permitting, living out his life in the same country where he had lived for twenty years.

The death of Frederick II and Friedrich Wilhelm's ascent to the throne had brought about changes to the composition of both the members and administration of the Berlin Academy: the Prussian members, even those of modest level, had increased in number, and foreign members were considered privileged. Moreover, the loss of Lagrange's wife, followed by the deaths of Euler and his friend d'Alembert the same year, 1783, had created in him a sense of emptiness, which led him to a period of depression and a reduction in his scientific output. This may have contributed to some academicians having designs on his position as director of mathematics and the substantial privileges in the shape of the 1,500 *écus* that Lagrange received as an ordinary member and 200 *écus* as director of the class.

His downgrade to honorary member (*membre honoraire*) was being considered, leaving him with only a part of his allowance, 1200 *livres*, less than a quarter of the 1500 *écus* corresponding to 6000 *livres*, but at the same time guaranteeing, to the Academy, the prestige of his name and the continuity of his scientific output. It was

[31]«Je ploins notre Ami Denina du fond de mon cœur; mais il n'est presque pas excusable de n'avoir pas connu dans l'espace de 40 ans le pais où il vit; je regarde cette connoissance comme la plus importante de toutes, et la premiere que tout homme sage doit se procurer pour pouvoir se regler en consequence. Ici on n'est pas gené à l'egard des livres, mais on l'est relativement aux etoffes; ailleurs on l'est à l'egard d'autres choses. Quoiqu'on en dise il me semble qu'il y a à peu près une egale liberté partout (j'entends la liberté particuliere qui est la veritable) la seule difference consiste dans les objets qu'elle regarde. Au reste le champ des Sciences et de la literature est asséz vaste pour qu'on puisse y acquerir de la reputation sans choquer ni la religion ni le gouvernement, et par consequent sans s'exposer à des chagrins.» (Borgato and Pepe 1989, pp. 231–232).

Count Mirabeau and the French Ambassador to Berlin who picked up on Lagrange's bitterness and tried to procure an engagement with the Academy of Paris by soliciting the help of the King of France.

The lack of prospects within the academy, combined with the reduction in his financial security, encouraged Lagrange to overcome his aversion to changing his life unnecessarily and make the decision to leave. Among the various offers he received, becoming a member of the Paris Academy of Sciences was definitely the most appropriate for him. Lagrange was to be given the same privileges he had received in Berlin as an ordinary member: an allowance of 6000 *livres*, as well as a complementary sum of 4000 *livres* to cover travel expenses. No further contribution was foreseen to compensate for the other 200 *écus*, since Lagrange had not been attributed any other duty that he had carried out in Berlin. On receiving Lagrange's acceptance, the Paris Academy of Sciences remarked that, as he could no longer be considered a foreign member (*associé étranger*), they were unable to provide a place as a *pensionnaire* (salaried member). The King, therefore, decided to make an exception for him and maintain the title of *pensionnaire vétéran*, but with the same rights and status as an ordinary member (underlining the fact that it was not to become a precedent).

As mentioned by Taton, Lagrange's arrival marked an important date in the development of the great French school of mathematical physics between the end of the eighteenth century and the beginning of the nineteenth.

Once news of his departure had spread, the academies of Naples and Turin both rushed to make him offers, as did the Grand Duke of Tuscany. Lagrange explained his situation in a long letter to his father, who did his utmost to persuade him to return to Turin (Berlin, March 24, 1787).[32]

Lagrange says[33]:

> I declared that I would not leave the place I occupied for another, but that if the munificence of the King deigned to make me enjoy in his States the pension of 1500 crowns that I had here, I would come and settle there, with all the more pleasure, as I could, while residing in

[32]This important letter, together with the previous one from Lagrange's father, was published for the first time in (Vassalli Eandi 1871, pp. 27–29) and reprinted in (Taton 1988, pp. 56–58) and in (Borgato-Pepe 1989, pp. 232–234).

[33]«Je déclarai que je ne quitterais pas la place que j'occupois pour une autre, mais que si la munificence du Roi daignoit me faire jouir dans ses Etats de la pension de 1500 écus que j'avois ici, je viendrois m'y fixer avec d'autant plus de plaisir, que je pourrois en résidant à Paris, profiter de mes entrées à l'Académie des sciences comme associé étranger […] On m'apprit au milieu de janvier que mon affaire avoit été faite aussitôt qu'on l'avoit proposée, et que le Roi avoit signé … une pension de 6000 livr. uniquement pour m'attirer en France […] D'ailleurs je n'ai jamais aimé les mathématiques pour les enseigner, ce que beaucoup d'autres peuvent faire, mais uniquement pour le plaisir de contribuer à leurs avancemens, et la place qu'on m'offre à Turin auroit été aussi peu de mon goût il y a vingt ans, qu'elle me conviendroit peu à présent que je viens de renoncer à celle de Directeur de cette Académie. Enfin, je ne dissimulerai pas que l'Académie de Paris a beaucoup d'attrait pour moi, comme étant le premier tribunal de l'Europe pour les sciences, et surtout parce qu'ayant l'avantage d'entendre la plupart des langues qui s'y parlent, je pourrois profiter d'une grande partie de ceux qu'on doit trouver dans ce Corps.»

> Paris, take advantage of my entry into the Académie des sciences as a foreign associate [...] I was informed in the middle of January that my business had been done as soon as it had been proposed, and that the King had signed [...] a pension of 6000 livr. only to attract me to France […] Besides, I have never liked mathematics for the sake of teaching, which many others can do, but only for the pleasure of contributing to its advancement, and the post I have been offered in Turin would have been so little to my liking twenty years ago that it would hardly suit me now that I have just given up that of Director of this Academy. Finally, I will not deny that the Academy of Paris has a lot of attraction for me, it being the first tribunal of Europe for the sciences, and especially because having the advantage of understanding most of the languages spoken there, I could benefit from a large part of those that one must meet in this Body.

And, after a few months, he confirms how right his decision was (Lagrange to his father, Paris, August 26, 1787)[34]:

> The very flattering manner in which I have been treated here fully justifies the decision I have taken in coming here and even if this change has not provided me with a better financial position, it has in accordance with my way of thinking and feeling, provided me with so much more in other things which have a more essential influence on my situation.

6 Lagrange in Paris. Collaboration with Political Authorities

Lagrange left Berlin in May 1787 and, on June 13, took part in his first session at the *Académie des Sciences.*[35] During the early years of the Revolution, Lagrange, together with other academicians, collaborated with the new political authorities. In 1790, he was part of the commission for the new system of weights and measures, firstly with Borda, Condorcet, Lavoisier, and Tillet, and then with Monge and Laplace. Lagrange reveals his changed attitude towards the government in a letter dated October 1791, in which, although he complained of the uncertainty and agitation in which he lived as a result of the political unrest, he declared that he was not displeased about having witnessed the event of a great nation procuring for itself a new government, through the comparison of ideas and public participation, rather than weapons.[36]

[34]«La maniere tres flatteuse dont j'ai ete traité ici justifie pleinement le parti que j'ai pris d'y venir; et si dans mon changement je n'ai point gagné du coté de l'argent, j'ai gagné d'autant plus a l'egard d'autre choses qui suivant ma manière de penser e de sentir ont une influence plus essentielle sur l'agrement de ma situation» (Borgato-Pepe 1989, p. 278).

[35]See (Taton 1988).

[36]The reform of the French Constitution had only been ratified a few months earlier, giving the legislative assembly complete control over legislation. Previously, in June, conflict between extreme revolutionaries and the National Guard had occurred, ending in the massacre of Camp de Mars.

Lagrange to a prince of the Caracciolo family (Paris, October 24, 1791)[37]:

> Now that tranquillity and order have been established, I do not regret having attended an event, all the more interesting for philosophers themselves, of a great nation that creates a new government, not by force of arms, but by that of speech and public opinion [...] The stay in Paris has lost nothing of its advantages and its amenities for those who did not wish to make use of them to court favours; it has even gained greater interest because of public debate of the principal matters of government.

In the same letter, Lagrange also states that the National Assembly had agreed to maintain his allowance, not based on any intervention on the part of Mirabeau, but because they wanted to respect a commitment undertaken with the Foreign Ministry.[38]

In November 1791, he was nominated as a member of the *Bureau des Arts et Métiers*, and in 1792, he was, for a few months, an administrator of the Mint.

His cooperation with the government, without taking an active part in any political disputes, allowed him to remain unscathed during the turbulent times of the French Revolution; he did, in fact, risk imprisonment as a foreign citizen when Piedmont entered into war with France, but Lavoisier intervened in his favor.

In those years of great political instability and personal tragedies, Lagrange was drawn into new situations: closure of the academies (August 1793), nomination of the Public Education Committee in the Paris area (January 1794), requisition of work for the Artillery (April 1794), collaboration in the reform of the French Republican Calendar (March 1794), teaching at the *Ecole normale* and the *Ecole centrale des travaux publics* (later, the *Ecole Politechnique*) (1795). At the end of December 1795, Lagrange was nominated as one of the first thirty members of the *Institut*, the new establishment created to replace the old academies with institutional duties of cooperation with the state and the management of research, and was elected president of the class of Mathematical and Physical Sciences.

When the Reign of Terror had passed, Lagrange's interest in human and social sciences was given free range. His rapport with Lavoisier is connected to an essay of statistical analysis that was published between the years 1795 and 1796 (Year IV of the French Republic): *Essai d'arithmétique politique, sur les premiers besoins de l'Intérieur de la République*.[39] This essay, neglected by Lagrange's biographers, casts further light on this little known aspect of his personality.

[37]«Maintenant que la tranquillité et l'ordre sont établis, je ne regrette pas d'avoir assisté à un spectacle, le plus intéressant pour les philosophes mêmes, celui d'une grande nation qui se crée un nouveau gouvernement, non par la force des armes, mais par celle de la parole et de l'opinion publique […] Le séjour de Paris'n'a rien perdu de ses avantages et de ses agréments pour ceux qui ne les faisaient pas consister à faire leur cour et à attraper des grâces; il a même acquis un plus grand intérêt par la discussion publique des principaux objets du gouvernement.» *Oeuvres de Lagrange*, XIV, pp. 283–284.

[38]«Je vous remercie de tout mon coeur de la part que vous voulez bien prendre à ce que l'Assemblée nationale a fait à mon égard. Si elle m'a conservé la pension que le Roi m'avait donnée, c'est qu'elle a voulu respecter un engagement dont les titres existaient au bureau des Affaires étrangères […]»

[39]Reprinted in *Oeuvres de Lagrange,* VII, pp. 571–579.

It was part of a collection of memoirs on political arithmetic printed by Roederer in 1796.[40] The first essay in the collection was by Lavoisier, on home production and consumption, already edited by order of the Constituent Assembly in 1791. It was an excerpt from a large study on political economy started by Lavoisier in 1784.[41] Roederer, as a member of the Committee of Public Contributions, had requested publication of Lavoisier's essay, and the collection was an homage to the unfortunate scientist.

This is how Roederer introduces political arithmetic as an inescapable instrument for the management of public affairs[42]:

> It is very easy to conceive that the science of political, or rather public, economy rests entirely on political arithmetic. When we know the aspects involved in the reproduction and distribution of wealth in different parts of a great country like France, and between different states; when all the products can be brought closer to all the circumstances that gave rise to them, and they are evaluated and compared with each other, reasoning will have little to do with deducing positive principles and certain theories.

Lagrange's essay does not carry the author's name, but is attributed to him in a note by Roederer: «This essay is by the famous La Grange, and although, through modesty, he was reluctant to have it published in his name, I have obtained his permission to do so, by showing him the deep conviction I have of the usefulness of his name for the success of the work and the utility of the work for public affairs».[43]

First of all, Lagrange established the population density per square league (25 million inhabitants over 27,126.47 square leagues equals 921.60 inhabitants per square league) in order to facilitate the comparison of the French population with that of other countries. Then, based on the population tables developed by Lavoisier, Lagrange examined the basic needs of the French population of 25 million inhabitants, which he classified into three groups, i.e., food, clothes, and accommodation, the last of which included heating and lighting. Lagrange chose to address food, in an essay that was probably only the first part of a wider study.

Thus, on the basis of data concerning merchandise subject to duties coming in and out of the city, as well as the domestic product, he calculated the mean values of the population's nutrition per inhabitant and compared them with the city of Paris and the rations given to soldiers. All food products were reduced to two types, grain

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[40]Lagrange (1795–1796). Pierre-Louis Roederer (1754–1835), deputy of the general States in October 1789, journalist during the Revolution, had been nominated for the class of Moral and Political Sciences at the *Institut* in December 1795.

[41]Lavoisier (1791). Also in Collection (1795–1796): 3–32.

[42]«Il est très-facile de concevoir que la science de l'économie politique, ou plutôt publique, repose toute entière sur l'arithmétique politique. Quand nous connoîtrons les faciès qui intéressent la reproduction et la distribution des richesses dans différentes parties d'un grand pais comme la France, et entre différens états; quand tous les produits pourront être rapprochés de toutes les circonstances qui les ont fait naître, qu'ils seront évalués et comparés les uns avec les autres, le raisonnement aura peu des choses à faire pour en déduire des principes positifs et des théories certaines».

[43]«Cet essai est du célèbre La Grange: sa modestie vouloit en cacher l'auteur. Je n'ai obtenu la permission de le nommer, qu'en lui montrant la profonde conviction que j'ai de l'utilité de son nom pour le succès de l'ouvrage et de l'utilité de l'ouvrage pour la chose publique».

(*blé*) and meat (*viande*), all beverages to one, that is, wine, on the basis of their presumed nutritious content in proportion to their sales price. At the end, certain conclusions were drawn.

Humans in general needed to consume the same weight in food, determined by their constitution. The difference in food, therefore, lay in the different proportions of grain and meat and in the other equivalents. This proportion for the soldiers was 7:2, for the inhabitants of Paris, it was 21:10, and for the whole of France, 15:2. This ratio was the real measure of the poverty or wealth of a state, since the welfare of the inhabitants depended essentially on food. In order to improve the welfare of the French, the consumption of meat had to be increased, even to the detriment of bread, by favouring breeding with artificial pastures and forage crops.

Lagrange concluded with some suggestions for home production in favour of food with a higher nutritional value: French agriculture provided sufficient grain for the population, but only about half the meat necessary so that each inhabitant could have the same ration as a soldier.

Later, as a member of the *Institut* of France, Lagrange favoured research on political arithmetic and statistics, as well as the application of mathematics to social phenomena and techniques, as witnessed by his reports on Duvillard's projects for the National Savings Bank, on Prony's for the register of landed property, and on Breguet and Betancourt's for the telegraph.

In 1803, the Ministry of Home Affairs ordered the *Institut* to examine the research on the population, particularly the birth and mortality rates, which had been carried out in thirty chosen areas and communes; in the session of 13 Thermidor year 11 (August 1, 1803), Lagrange and Laplace were authorised to perform this task.

7 Conclusions

Lagrange was almost always seen as a scientist immersed in the mathematics of his time, which also included mechanics and astronomy (Burzio 1943; Sarton 1944). Indeed, in the various fields of these disciplines, from number theory to algebra, from mathematical analysis to mechanics and astronomy, we find his fundamental contributions made over a lifetime, from the calculus of variations (1755) to the re-edition of his treatises *Mécanique analitique* (1811, 1815) and *Théorie des fonctions analytiques* (1813) (Pepe 2014).

However, previous studies had already highlighted the breadth of the interests of the Turin mathematician, documented, for example, from his rich library and from his contributions to the historiography of mathematics (Borgato 1989). In Turin in 1757, he had founded a private scientific society with Giuseppe Angelo Saluzzo and Giovan Francesco Cigna, which also dealt with natural sciences, including chemistry, botany and medicine. The private scientific society was inspired by the Académie des Sciences et Belles-Lettres in Berlin, and its *Miscellanea* also included, for instance, a philosophical essay by Giacinto Sigismondo Gerdil and one historical-topographical by Angelo Paolo Carena on the Po River (Pepe 1996).

Lagrange's Parisian period saw him involved in a wide range of interests, from frequenting Lavoisier's circle and laboratory[44] to participation in the commission for the system of weights and measures, the administration of the Mint, and the revision on behalf of the Institut of a large number of works and projects (Pepe 1992; Borgato and Pepe 1990b).

Lagrange's Berlin period seemed to mark a pause in these broad interests; over twenty years (1766–1787), in fact, he produced a large number of mathematical memoirs, of which forty-nine were published in the Acts of the Berlin Academy (Harnack 1900). During this period, however, in spite of his tendency to be reserved, his participation in academic life was not limited to his research and mathematical interests alone, as emerges from the academic reports and some surviving documents.

Other studies, moreover, have documented Lagrange's interest in the theory of games (Borgato 2012) and in human sciences, particularly in regard to problems of insurance and pensions in favour of widows and orphans (Borgato 2013). Lagrange was prompted to deal with this issue by a direct request from his academic colleagues (as he himself states), but he was probably also influenced by the cultural climate and the debates that took place at the Academy.

Lagrange had contacts with academics who drew on the Leibnizian rationalist tradition, recognized, in statistics, the possibility of freeing humans from their evils and overcoming passive submission to their destiny, and found an ethical base in insurance as a form of sharing the risk (from natural disasters, diseases, etc.) among the population. One member of the Academy of Sciences (from 1745) was Johann Peter Süssmilch, former chaplain in the army of King Frederick II of Prussia, then provost of the Parish of St. Peter in Berlin. He is considered the founder of modern demography, due to his studies on birth, nuptiality, mortality and their correlations in his famous work *Die Göttliche Ordnung*.[45] Süssmilch's statistics, to which Euler also collaborated (in 1761), were among the most reliable of his time, were reprinted several times and continued to be used in the nineteenth century to calculate insurance premiums. Lagrange himself used them for his work on orphan insurance. Süssmilch fits into the trend of German rationalist theology inaugurated by Caspar Neumann, whose mortality tables relating to the city of Breslau had been used by Halley for his famous memoir on annuities, *An estimate of the degrees of the mortality of mankind* (1693).

Louis de Beausobre had been a pupil of Johann Heinrich Samuel Formey, one of the founders and then secretary of the Berlin Academy, at the Collège de France in Berlin. Both having come from Huguenot families, de Beausobre was protected by Frederick II, who helped him in his studies. Many Huguenots had moved to Berlin, welcomed by Frederick II of Prussia. Johann Heinrich Lambert, also of a Huguenot

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[44]At that time, Lagrange believed that mathematics had exhausted its potential for development and saw chemistry as the new frontier of science: « La Physique et la Chimie offrent maintenant des richesses plus brillantes et d'une exploitation plus facile; aussi le gout du siecle parait-il entierement tourne de ce cote-la; il n'est pas impossible que les places de Geometrie dans les Academies ne deviennent un jour ce que sont actuellement les chaires d'arabe dans les Universites.» Lagrange to d'Alembert, September 21, 1781, *Oeuvres de Lagrange*, XIII, p. 368.

[45]Süssmilch (1761–1762).

family, from Mulhouse in Alsace (then in Switzerland), had joined the Berlin Academy as a full (salaried) member in 1763. Lambert earned the support of Frederick II, and he befriended Euler. Within Lambert's vast and eclectic scientific and philosophical production,[46] statistical studies also occupied a significant place, and he used them to address the interference between nuptiality and mortality and the mortality of children due to smallpox, providing a mathematical modeling of these phenomena in the process (1765, 1772). Lambert is considered, along with Euler, to be one of the founders of mathematical demography.[47]

The story of the pension fund for widows in which Lagrange was involved is linked to various previous events, some of which were traumatic. Euler had been consulted by Frederick II, who wanted to set up a pension fund for widows. The Prussian state had set up a previous fund for state employees only, which had not been successful. Euler, however, after leaving Berlin, published the first memoirs in which he introduced notations and basic principles of the calculation of annuities (Euler 1767a, b).[48] Euler's plan for a pension fund for widows was presented to the Academy of St. Petersburg in 1769 and published in German in Hamburg the following year (Euler 1770). It was then republished in French, with the addition of several tables, in St. Petersburg (Euler 1776).

But the Berlin institution had had a famous precedent in those years that turned out to be bankrupt: the mutual fund for the widows of the Principality of Calenberg, in Hanover. This fund, managed but not guaranteed by the state, was financed only by subscriptions and open to anyone who wanted to sign a contract. Euler had been directly consulted by Augustin Kritter, a senator in Gottingen, in the midst of a controversy Kritter was having with the fund administrator Anton Dies (1768). The bankruptcy of the fund created enormous discontent and had great resonance, even outside the German states. It also spurred debates among scholars about the correct foundations of a similar insurance institution.

Lagrange's choices to move, first from Turin to Berlin and then from there to Paris, were always motivated by the need to guarantee a comfortable life and a scientific position that would allow him to freely develop his research. No adventurous desire for change, no passion for travel, not even to see his family again. Among the effects of this Turin-born scientist's relocation first to Prussia and then to France, there was, obviously, the enormous loss to the Turin scientific community of his talent, which could have continued to promote scientific research there, and, on the other hand, there was the advantage acquired by the Academy of Berlin, which reached the highest levels of European mathematical research, even after the loss of Euler. Much has been written of Lagrange's role before, during and after the French Revolution, and of his involvement in the new research and educational structures such as the Institut, the Ecole Normale and the Ecole Polytechnique.

[46]For a general description of Lambert's mathematical production, see (Gray and Tilling 1978); for the theory of probability in particular, see (Sheynin 1971).
[47]A bilingual (German–French) critical edition of Lambert's writings on these topics, by J.-M. Rohrbasser and J. Véron in (Lambert 2006).
[48]On Euler's contribution to the foundation of mathematical theory of insurance, see (Du Pasquier 1923; Borgato 2013).

But this double migration also had an effect on the scientist's personality.

The initial negative experiences in his relations with the authorities had instilled in him an attitude of prudent detachment towards politics and social events. New documents have demonstrated that the first decade of his life in Berlin was marked by, in addition to his very intense study and research activity, the persistence of his broader cultural interests, towards other scientific disciplines and literature, and participation in social issues to which mathematics could contribute in the interpretation and regulation. The abrupt warning of the Prussian minister who reproached him for interfering in government matters prompted him, after an initial reaction of injured pride, to again take a more cautious attitude.

However, when the security he was looking for disappeared, and he was once more forced to change his life and move to a Paris that was prey to the upheavals of power and the emergence of new demands by the bourgeoisie and the people, the belief in the ideals of the Enlightenment aimed at improving society through scientific progress re-emerged in Lagrange. His interest in the discoveries of chemistry and participation in the Lavoisier circle, in political arithmetic professed by the French *philosophes*, and his willing collaboration, even if imposed, with the revolutionary authorities in technical matters, appear to have been conscious choices, which would find their complete realization during the Napoleonic period.[49]

Aknowledgements I would like to thank the Archives of the Berlin-Brandenburg Academy of Sciences and Humanities, the Archives of the French Academy of Sciences and the Library of the Institute de France for their kind and fruitful collaboration in research and access to their documents.

Appendix. Lagrange at the Berlin Academy

Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften

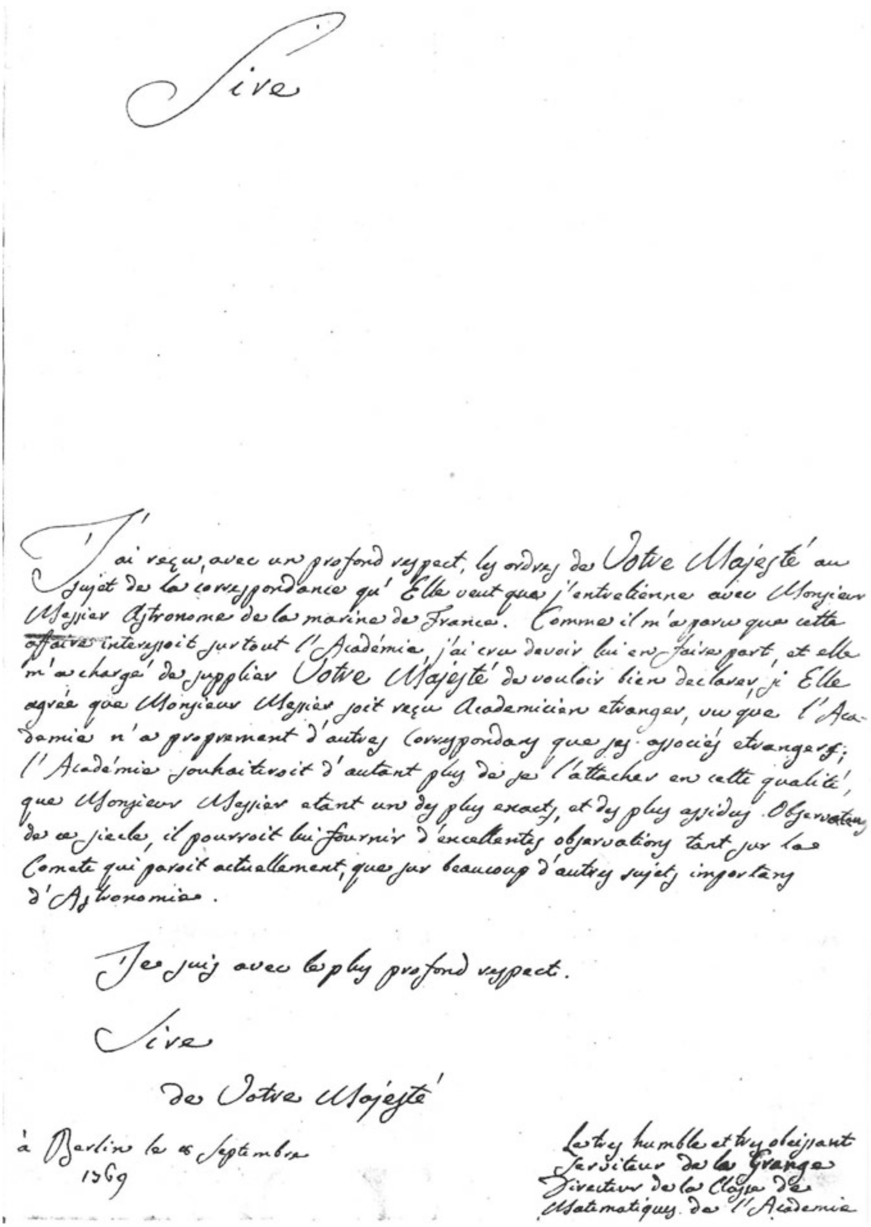
1. **Joseph Louis Lagrange to Frederick II, Berlin, 8th September 1769**

Sire.

J'ai reçu avec un profond respect, les ordres de Votre Majesté au sujet de la correspondance qu'Elle veut que j'entretienne avec Monsieur Messier Astronome de la marine de France.[50] Comme il m'a paru que cette affaire interessoit

[49]On the occasion of the second centenary of Lagrange's death, several events took place, with seminars, conferences and exhibitions, in particular, in Paris, at the Institut Henri Poincaré, and in Turin, organized by the Academy of Sciences (Catalogue 2013). A monographic issue dedicated to Lagrange was published in the journal *Lettera Matematica Pristem* 88–89 (March 2014).

[50]Charles Messier (1730–1817), first as Delisle's pupil and collaborator and then as the official astronomer, conducted many detailed astronomical measurements at the Naval Observatory, set up by Delisle at the Hôtel de Cluny in Paris. Messier joined the Berlin Academy on September 9, 1769. He discovered numerous comets and different nebulae, creating the first usable catalogue of



Sire

J'ai reçu, avec un profond respect, les ordres de Votre Majesté au sujet de la correspondance qu'Elle veut que j'entretienne avec Monsieur Messier Astronome de la marine de France. Comme il m'a paru que cette affaire interessoit surtout l'Académie, j'ai cru devoir lui en faire part, et elle m'a chargé de supplier Votre Majesté de vouloir bien declarer, si Elle agrée que Monsieur Messier soit reçu Academicien etranger, vu que l'Academie n'a proprement d'autres Correspondans que ses associés etrangers; l'Académie souhaiteroit d'autant plus de se l'attacher en cette qualité, que Monsieur Messier etant un des plus exacts, et des plus assidus Observateurs de ce siecle, il pourroit lui fournir d'excellentes observations tant sur la Comete qui paroit actuellement, que sur beaucoup d'autres sujets importans d'Astronomie.

Je suis avec le plus profond respect.

Sire

de Votre Majesté

à Berlin le 8 Septembre 1769

Le tres humble et tres obeissant Serviteur de la Grange Directeur de la Classe de Matematiques de l'Academie

Fig. 4 Joseph Louis Lagrange to Frederick II, Berlin, 8th September 1769**.** Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften, I III 3/ Bl 40

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the latter in 1771. In the journal of the Berlin Academy in those years, he published important observations on the still debated question of the disappearance and reappearance of the rings of Saturn (Messier 1799).

surtout l'Académie, j'ai cru devoir lui en faire part, et elle m'a chargé de supplier Votre Majesté de vouloir bien declarer, si Elle agrée que Monsieur Messier soit reçu Academicien etranger, vu que l'Academie n'a proprement d'autres correspondans que ses associés etrangers; l'Académie souhaiteroit d'autant plus de se l'attacher en cette qualité, que Monsieur Messier etant un des plus exact, et des plus assidus Observateurs de ce siecle, il pourrait lui fournir d'excellentes observations tant sur la Comete qui paroit actuellement, que sur beaucoup d'autres sujets importans d'Astronomie.

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directeur de la Classe de Mathématiques de l'Académie

à Berlin le 8 Septembre 1769

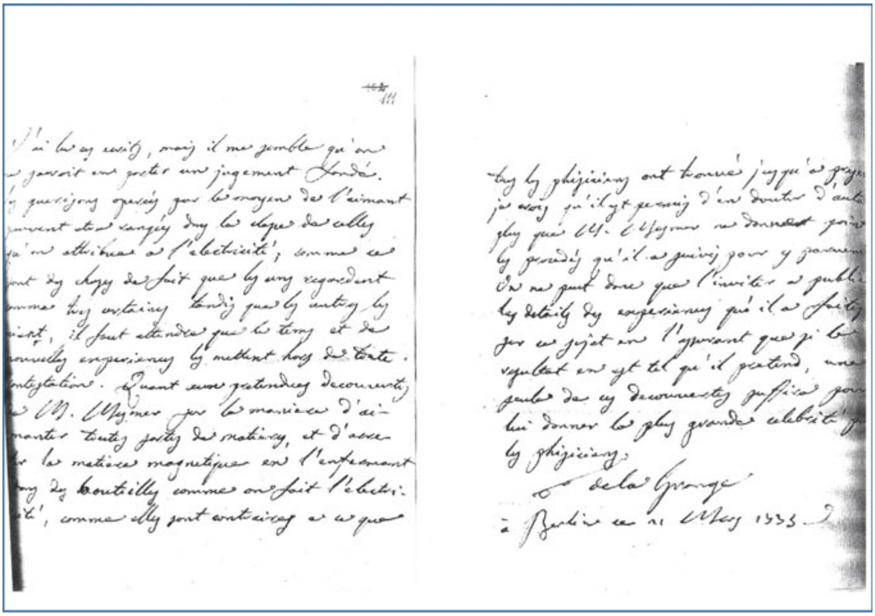

Fig. 5 Lagrange's report on the book by Anton Mesmer: *Schreiben über die Magnetkur* (Wien 1775), Berlin, 21st March 1775. Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften, I V 5b/ Bl 111

2. **Review of the book: *Schreiben über die Magnetkur von Herren A. Mesmer*, Gedruckt bey Joseph Kurzböck, Wien 1775**

Berlin, 21st March 1775

J'ai bien lu ces ecrits, mais il me semble qu'on ne pour[r]oit en porter un jugement fondé. Les guerisons operées par le moyen de l'aimant peuvent etre rangés dans la classe de celles qu'on attribue a l'electricité; comme ce sont des choses de fait que les uns regardent comme tres certaines tandis que les autres les nient, il faut attendre que le tems et de nouvelles experiences les mettent hors de toute contestation. Quant aux pretendues decouvertes de M. Mesmer[51] sur la maniere d'aimanter toutes sortes de matieres, et d'arreter la matiere magnetique en l'enfermant dans des bouteilles comme on fait l'electricité, comme elles sont contraires a ce que tous les phisiciens ont trouvé jusqu'a present je crois qu'il est permis d'en douter d'autant plus que M. Mesmer ne donne point les procedés qu'il a suivi pour y parvenir. On ne peut donc que l'inviter a publier les details des experiences qu'il a faites sur ce sujet en l'assurant que si le resultat en est tel qu'il pretend, une seule de ces decouvertes suffira pour lui donner la plus grande celebrité parmi les phisiciens.

de la Grange

à Berlin ce 21 Mars 1775

[51]Franz Anton Mesmer (1734–1815), a physician active in Vienna until 1777, claimed that he had discovered extraordinary influences of animal magnetism in the treatment of various diseases. His experiments brought him considerable notoriety, but also inspired scandals that led him to move to Paris to continue his activity and research, where he obtained success. Mozart included a joking reference to mesmerism in his opera *Cosi fan tutte*. The French Academy of Sciences, together with the Society of Medicine, was commissioned to investigate the practice of animal magnetism in 1784. The unfavorable report was presented by Bailly, and signed by Benjamin Franklin and the academicians Lavoisier, Le Roy, and de Bory. The phenomenon of mesmerism has fueled a vast literature. We limit ourselves to mentioning (Darnton 1968) and (Belhoste and Edelman 2015).

Schreiben
über die
Magnetkur
von
Herrn A. Mesmer,
Doktor der Arzneygelährtheit,
an
einen auswärtigen Arzt.

WIEN,
gedruckt bey Joseph Kurzböck, k. k. illyrisch = und
oriental. Hofbuchdruckern und Buchhändl.
1775.

Fig. 6 Title page of the book: *Schreiben über die Magnetkur von Herren A. Mesmer*, Gedruckt bey Joseph Kurzböck, Wien 1775

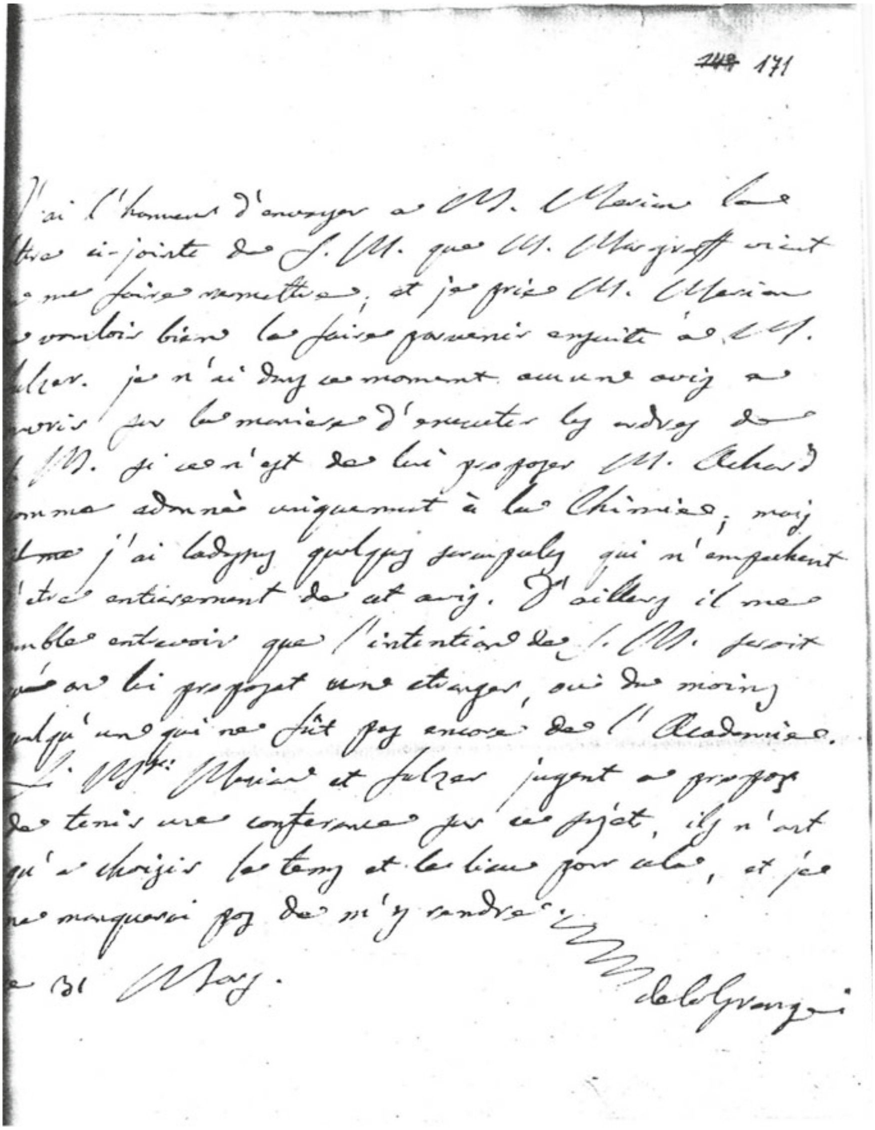

Fig. 7 Joseph Louis Lagrange to Jean Bernard Mérian, Berlin 31st March [1776]. Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften, I V 5b/ Bl 171

3. Joseph Louis Lagrange to Jean Bernard Mérian, Berlin 31st March [1776]

J'ai l'honneur d'envoyer a M. Merian[52] la lettre ci-jointe de S. M. que M. Margraff[53] vient de me faire remettre; et je prie M. Merian de vouloir bien la faire parvenir ensuite a M. Sulzer.[54] Je n'ai dans ce moment aucun avis a [...] sur la maniere d'executer les orders de S. M. si ce n'est de lui proposer M. Achard[55] comme adonné uniquement à la Chimie; mais j'ai la dessus quelques scrupules qui m'empechent d'etre entierement de cet avis. D'ailleurs il me semble entrevoir que l'intention de S. M. seroit qu'on lui proposat un etranger, ou du moins quelqu'un qui ne fût pas encore de l'Academie. Si M^rs de Merian et Sulzer jugent a propos de tenir une conference sur ce sujet, ils n'ont qu'a choisir le tems et le lieu pour cela, et je ne manquerai pas de m'y rendre.

ce 31 Mars

de la Grange.

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[52]Johann Bernhard Merian or Jean Bernard Mérian (1723–1807) was introduced to the Berlin Academy by Maupertuis. He was appointed director of studies in 1772 and, upon Formey's death (1711–1797), he became the perpetual secretary of the Academy.

[53]Andreas Sigismund Marggraf (Margraff, Margraaf) (1709–1782), director of the experimental philosophy (physics) class of the Berlin Academy. A pioneer of analytical and organic chemistry, he is remembered for isolating zinc and introducing several new methods into experimental chemistry. See (Condorcet 1785).

[54]Johann Georg Sulzer (1720–1779), an academician beginning in 1750, became director of the philosophy class in 1775. He translated David Hume's essay, *An enquiry*, into German in 1755.

[55]Franz Carl Achard (1753–1821), born in Berlin into a Huguenot family, a protégé of Frederick II and a disciple of Marggraf, was elected to the Prussian Academy in 1776 and, upon Marggraf's death, became director of the physics class. He is famous for having perfected the industrial process of extracting sugar from beets (Achard 1799).

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The Delisle Brothers in Russia: Victims of Historiography and Scurvy

Dmitri Gouzévitch

Abstract

In this paper, we will focus on the problem of maps for the Second Kamchatka Expedition (1733–1743), the most important 18th century exploratory enterprise of the Russian Crown which marked a major step in the history of discoveries and a decisive turning point in the mapping of the northern Pacific. Given the controversial role played in this story by the French cartographer Joseph Nicolas Delisle and his elder brother, the astronomer and explorer Louis Delisle de La Croyère, we would like to offer our vision of this conflictual situation, based on the detailed cross analysis of existing historiography, correspondences, academic sources, and the maps themselves.

Keywords

Second Kamchatka Expedition · Delisle · Delisle de la Croyère · Mapping of the northern Pacific · Bering · Siberia · 18th century discoveries

1 Introduction

The Delisle family, which includes five distinguished astronomers and geographers the father and his four sons—is well known by historians of science. This article will focus on two of them, both of whom experienced the fate of scientific migrants—the famous astronomer Joseph Nicolas Delisle (1688–1768) and his older brother, Louis Delisle de La Croyère (1687–1741) (Figs. 1 and 2). The two brothers came to settle in

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Fig. 1 Joseph-Nicolas Delisle. Engraving, 18th century

Fig. 2 Louis Delisle de La Croyère. Engraving, 18th century

Russia in 1726, at the opening of the Saint-Petersburg Academy of Sciences. The former spent twenty-one years of his life in Russia, before returning to France in 1747. The latter died there while still working, in 1741. The two brothers left their mark on the world of science, and both have been tarred with a very bad reputation in Russian historiography. Louis Delisle de La Croyère is regularly treated as a non-entity and a drunkard.[1] As for Joseph Nicolas, he is currently presented as a thief and saboteur (who is believed to have stolen several hundred Russian maps). In addition, he is designated as the person most responsible for the misfortunes of the Second Kamchatka Expedition (also known as the Great Siberian Expedition).

I will not address the problems of the alleged theft here. A series of recent studies has clearly demonstrated that Delisle did not steal the maps, but had rather copied them, more or less in accordance with his contract.[2] According to the accounts of his contemporaries, he regularly took them out of the trash, where his Russian colleague, the cartographer Ivan Kirillov, used to throw his drafts after they had been engraved.[3] In this paper, I will focus on the problem of the maps for the Second Kamchatka Expedition, which marked a major step in the history of discoveries and a decisive turning point in the mapping of the northern Pacific. Given the controversial role played—by the Delisle brothers, I would like to offer my vision of this story, based on an analysis of correspondences, academic sources and the maps themselves.[4]

2 Early Russian Discoveries in the Pacific

Indeed, few geographical maps of the 18th century caused as much controversy, curses and accusations against their author as the map prepared by Joseph Nicolas Delisle in 1731–1733 for the Second Kamchatka Expedition. (Fig. 3).

The Russian explorers reached the shores of the Pacific rather early. In 1639, the Cossack detachment of Ivan Moskvitin went to the Okhotsk Sea, close to the river Ul'ja, and sailed north by sea to Okhotsk.

The next breakthrough took place in 1648, when the explorer Semyon Dezhnev, making a sea voyage from Kolyma to Anadyr, crossed the strait between Asia and America (now the Bering Strait) and passed the cape that came to bear his name. The ruling circles in Moscow were aware of this fact: Dezhnev visited the Russian capital twice and was even awarded the rank of ataman for his discovery. However, this fact seemed eventually to have been firmly forgotten. At least half a century later, in Saint-Petersburg, no one knew or had even heard about it. Dezhnev's written reports remained in the archives in Yakutsk, where they were found in 1736 by the academician Gerhard Friedrich Müller during the Second Kamchatka

[1] Bagrow, 2005, p. 414; Berg, 1946; Gusarova, 2013, p. 129; Efimov, 1950, p. 200; Efimov, 1971, p. 249; Kalmykov, 2012; Müller, 2006, pp. 648–649, 657; et al.

[2] Bogdanov et al., 2012; Golubinskij, 2019; Gouzévitch D., Gouzévitch I., 2014; et al.

[3] Ehrensvärd, 2009, pp. 254–256; Rjeoutski V., Gouzévitch D. (eds.), 2019, p. 222.

[4] For the first, short draft of this study, see its Russian version: Gouzévitch D., Gouzévitch I., 2019.

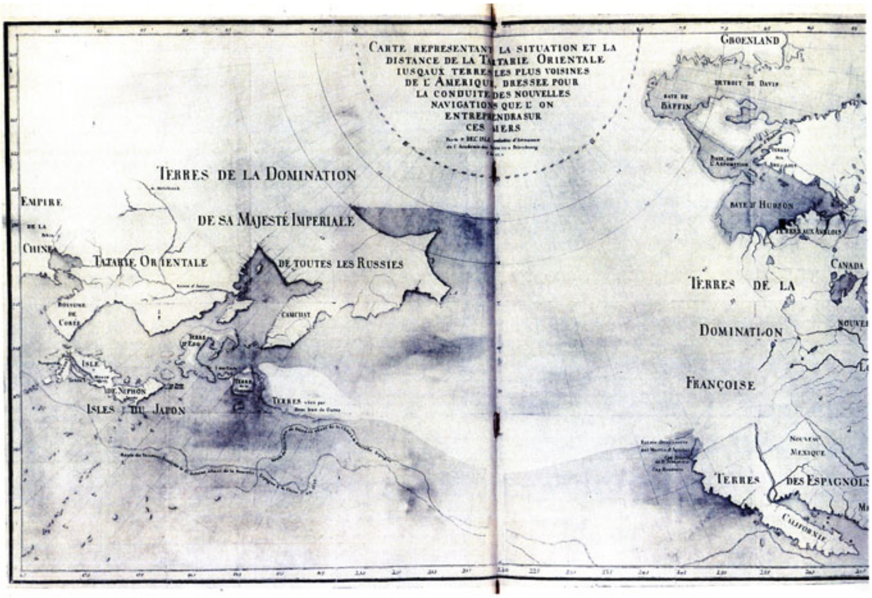

Fig. 3 Joseph-Nicolas Delisle. The Map prepared for the Second Kamchatka Expedition. 1731–1733. Fragment

Expedition (Polevoj, 1975, p. 32). In 1741, the diaries of the sub-navigator, Ivan Fedorov, dating back to 1732 and containing his description of the Bering Strait and its islands, were also found. Together with two reports produced in 1741 and 1743 by the surveyor Mikhail Gvozdev, they gave new information about the strait (see below). This situation gave way to a historical paradox: during the Second Kamchatka Expedition, the existence of the strait between Asia and America was twice confirmed on land, although the expedition's naval teams did not pass through it.

Thus, back in the first third of the 18th century, the Russian State was not aware of its eastern and northeastern sea borders.

3 The Infernal Question

The question as to "whether America met with Asia" was first posed to the Russian monarch Peter I by the Mayor of Amsterdam, Nicolaas Witsen (Polevoj, 1975), in autumn 1697, while the former was visiting the city. The latter had become interested in the problem back in the 1660 s and spent many years collecting and systematizing information about Siberia as part of Northern and Eastern Tartaria, as well as creating the corresponding maps. The first edition of the book *Noord en Oost Tartarye* < ... > was published in 1692, the second, almost twice the length, in 1705 (Vitsen, 2010). Therefore, Witsen understood better than anyone the need for exploration of the eastern territories of the Russian state. At the beginning of the 18th century, thanks to his own studies, Witsen was already sure that Asia and America did not meet, but that they did come close to each other. It was necessary to find out where and how close. Peter I's other adviser on this issue was Gottfried Wilhelm Leibniz, who, in 1712 and 1716, wrote letters on this subject to Yakov Bruce and the Tzar himself.[5] In 1713 and 1714, Peter I's marine agent, Fedor Saltykov, who was living in England, submitted to the Tzar projects aimed at finding a free northern sea route from the mouths of the Dvina and the Yenisei to the river Amur and China.

If, for Witsen and Leibniz, the question was purely academic, for Peter I, matters of economics and the study of the natural resources of his own land, such as fur, ores and sea crafts, were of no less importance. However, the idea that there might be silver ore on the Kuriles also belonged to Witsen.

After 1717, when the victorious outcome of the Northern War became evident, Peter I initiated a series of expeditions to study Siberia; the goal was purely scientific—finding out "whether America met with Asia", dissimulating a more prosaic reason behind the expeditions. Thus, according to one version, the expedition of Ivan Evreinov and Fedor Luzhin used this pretext, in 1719–1721, to "survey the Kuril Islands and search for a sea route to Japan" (Čekurov, 1976, p. 71), which was considered to be "rich in gold". However, according to another version, Evreinov and Luzhin were to investigate the Kuril Islands because it was believed that Asia and America were drawing closer precisely in this area (a hypothesis supported by Witsen) (Polevoj, 1975, p. 26).

Both reasons were plausible, and the results of the expedition were classified (Čekurov, 1976). However, Peter I considered it useful to make public the information that established Russian priority in the discovery of lands and, accordingly, their recording as possessions of the Russian crown.

Thus, no later than 1722, Evreinov and Luzhin, who initiated the geodetic survey of the Russian Pacific coast, created a handwritten map with a rather precise outline of Kamchatka and the northern part of the Kuril ridge (Fig. 4).[6] Moreover, as early as that same year, the Nuremberg cartographer Johann Baptist Homann, using their data, which had been sent to him by Bruce on the orders of Peter I, published the map of «Kamchadalia» (a diptych with, on its left side, a new outline of the Caspian Sea, Fig. 5). The cartographer died in 1724, but the following year, his map was integrated by his heirs into the so-called atlas of Homann. This map included, to the east of Kamchatka, a nameless land then called "Terra Borealis", or "Terra de Joan de Gama", or "Terra Esonis" (it is not actually represented in Evreinov's handwritten map; for the explanation of the names, see below). Two maps of Asia created by the Homann family at the beginning of the 18th century and later in 1730 help to evaluate Evreinov and Luzhin's expedition achievements: they contributed to a more precise mapping of the northeastern outlines of Asia, where Kamchatka

[5] Bagrow, 2005, pp. 388–389; Ger'e, 1870, pp. 336–337, 377–378, 384; Polevoj, 1975, pp. 19, 25.
[6] Efimov, ed., 1964, n°58, p. IX, 40.

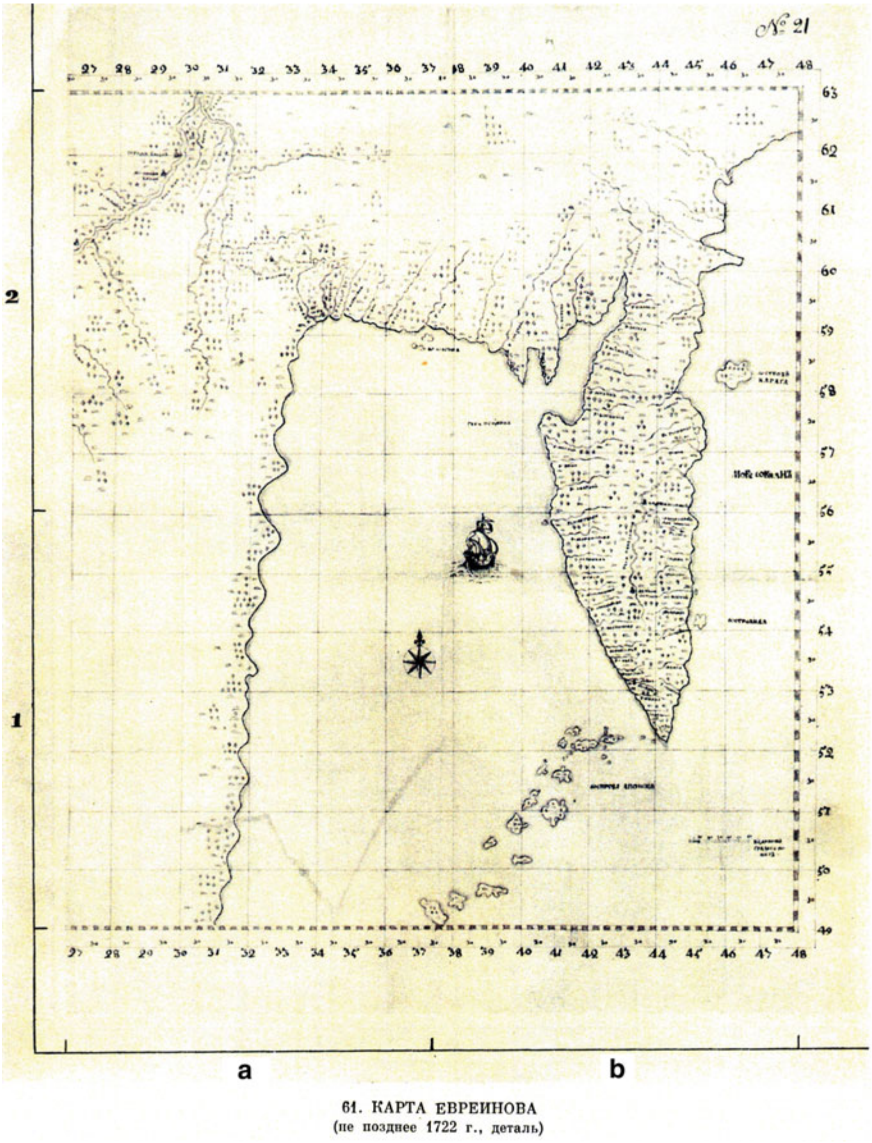

Fig. 4 Ivan Evreinov. The Map of Kamchatka and the Northern part of the Kuril ridge. Not later than 1722. Fragment

and the Kuril ("Japanese") Islands appeared, but where, to the east, it was still an enigmatic "Compagny Land" (Figs. 6 and 7).

Unlike Peter, his followers did not know how to combine the secrecy of some data with the broad dissemination of others. In general, the "geographical secrecy" did the Russian crown no favours. Thus, the subsequent expeditions knew little

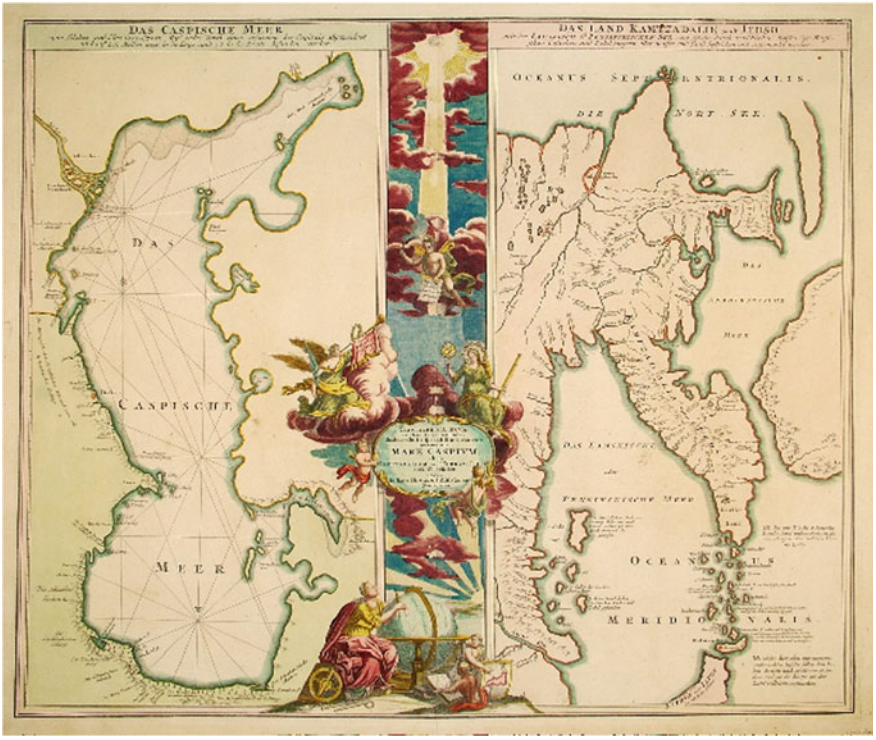

Fig. 5 Johann Baptist Homann. Diptych: Caspean Sea and Kamchadalia. 1722

about their predecessors' research (this situation began to change only in the second half of the 18th century), and the data obtained were hidden in the depths of the archives. This happened, for example, with the expedition of Daniel Gottlieb Messerschmidt (1685–1735), sent by Peter I, in 1718, to study the natural resources of Siberia. Messerschmidt didn't return until 1727, bringing huge collections of gathered and systematized materials (botanical, zoological, geological, geographical, ethnographic, archaeological, etc.), which were taken away and locked in storage (a large part of which was destroyed in the fire of the Kunstkamera in 1747), whereas his 10-volume work in Latin entitled *Survey of Siberia, or Three tables of simple kingdoms of nature* remained in manuscript form. Messerschmidt himself, the man who discovered the permafrost, died shortly after. In 1737, his widow married the naturalist Georg Wilhelm Steller (1709–1746), who had arrived in Russia shortly beforehand. He was thus, perhaps, the only person at the time who made an in-depth study of Messerschmidt's materials, which were not published until the end of the 18th century.

Fig. 6 Johann Baptist Homann. The Map of Asia. By 1700

The later expeditions had to face the same problem. Officially, they were sent with the—purely scientific purpose of checking "whether the American shores meet with those of Asia" (quoted in (Čekurov, 1976, p. 70)), whereas their special secret instructions concerned economic tasks, because the islands in the east were considered rich in gold, copper, and silver. Thus, the secret instruction for the first expedition of Vitus Bering gave him orders to search for unconquered lands and subdue the populations: "But strongly beware of going to such American and Asian places where the possessions of European sovereigns or the Chinese emperor and the Japanese khan are to be found, so as not to provoke suspicion nor to show them, by their very arrival, the path to the Kamchatka shores, about which they are still unaware, and given the scarce population in the area, above all to prevent them occupying the good quays" (quot. (Čekurov, 1976, pp. 72–73)). The tasks of economic development of Kamchatka and the creation of the Far Eastern fleet (the Siberian administration being required to help in these matters) are clearly set out in

Fig. 7 Johann Baptist Homann. The Map of Asia. By 1730

the instruction of April 17 (anc. st.), 1732[7], for the Second Kamchatka Expedition: "… on the building of ships and other matters increasing our benefits and interests" [PSZ-1. № 6023].

4 The Mysterious Lands on the Maps of the North Pacific

How could the above-mentioned mysterious lands have appeared on the maps of the North Pacific area? It was mostly due to the testimonies, be they genuine or imaginary, of various travellers. For example, the "Land of Gama" (Terra da Gama) appeared on the maps in 1649, thanks to the Portuguese cartographer Texeira, as a

[7]Dates in this article are given on the Gregorian calendar or, for the events inside Russia, according to two calendars, separated by a slash (/): the Julian, which was used in Russia, and the Georgian, which was used in Western Europe. During the period concerning this study, the différence was of 11 days. – The present chapter is illustrated with copies of the 18th century engravings and their fragments, which are in open access, as well as by a drawing from the author's personal collection.

Fig. 8 Guillaume Delisle. The Map of Asia. By 1700

land allegedly seen by the Portuguese explorer João da Gama. The so-called "Yeso Land" (Terre D'Eso) was "discovered" to the northeast of Japan. There were other phantom areas as well, such as the "Land of the States" (Terre des Etats) and the "Land of the Company" (Terre de la Compagnie) supposedly discovered by Dutch sailors, and even the "Land of Gog and Magog". In 1643, the Dutch navigator Martin Gerritszoon de Vries reached southern Sakhalin and took the western shore of the "Land of the Company" (in reality, the island of Urup) above the coast of North America, and the strait between the Land of the States and the Land of the Company for the legendary Strait of Anian, dividing Asia and America (appearing on the maps of 1561 (1562?) under the influence of Marco Polo's descriptions).

As a result, the French geographer Guillaume Delisle had good reasons to state: "Nothing definite can be said about the northern part of the Pacific Ocean" (quoted in (Čekurov, 1976, p.72)). On the map of Asia that he drew in 1700 (Fig. 8), all of the mysterious lands are mentioned: the "Terre d'Yeco", as well as the "I < sle > des Etats" and the "Terre de la Compagnie" with a note: "Coste découverte par Dom Jean de Gama allant de la Chine en la Nouvelle Espagne". For the "Terre de Gama" itself, traditionally located east of the "Terre de la Compagnie", there was no place on the map. On his *Carte de Tartarie*, drawn in 1706, there was only a place for the "Terre d'Eso ou d'Yeço", and it is indicated there (Fig. 9).

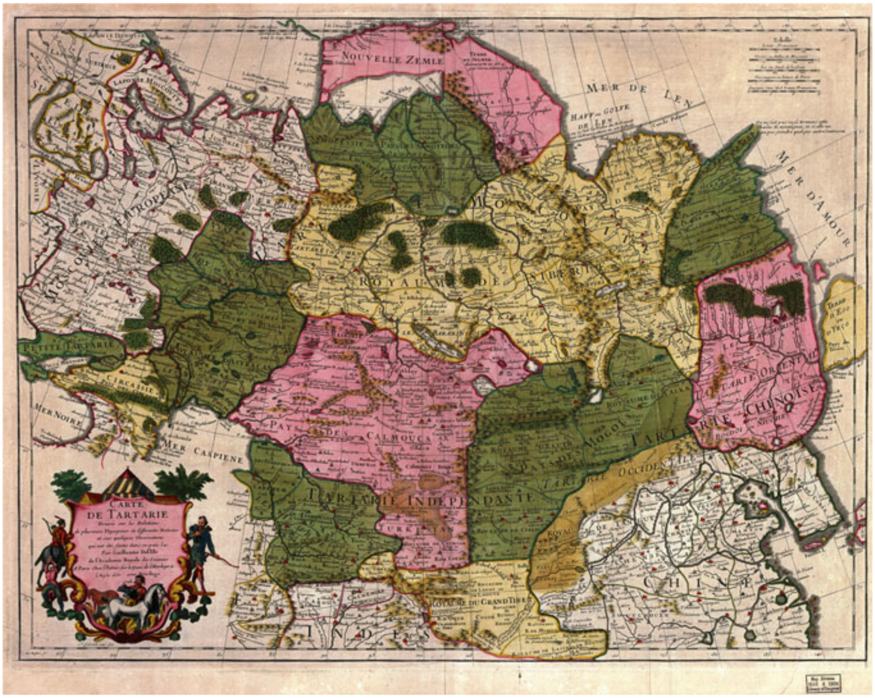

Fig. 9 Guillaume Delisle. The Map of Tartaria. 1706

5 The First Kamchatka Expedition of Bering

The first Russian expedition, which had to check the availability of these lands and sail to America, was the First Kamchatka Expedition of Bering (6/17.2.1725—1/12.3.1730[8]). According to Peter I's instructions, after reaching the American shore, the expedition was supposed to go southwards along it to the first cities founded by Europeans (Spaniards) and record the presence of Russians on the northern part of the American coast. In fact, the aim of the expedition was to find not the strait between Asia and America, but the sea route to America. Peter I was mainly interested in the expansion of Russian possessions in the east. If Bering had carried out the Tsar's instructions, his expedition would have been the first step in the development of Russian California, and the history of these territories might have been very different. However, having signed a decree on the equipment of the expedition on 23.12.1724/3.1.1725, and because he was ill, Peter I did not have time to talk to Bering as to its purpose. As for the official instruction, "On the discovery of the connection of Asia with America", the captain received it only on

[8]The advance detachment left Petersburg on 25.1/8.2.1725 (Divin, 1953, p. 44).

Fig. 10 The navigation of Vitus Bering and Alexei Chirikov in 1728 and 1741

5/16.2.1725, after the death of the emperor, from the hands of Catherine I [PSZ-1. № 4649], and he did not understand it clearly. The instruction of the Senate quoted above required secrecy, contributing to this misunderstanding. As a result, after reaching the Lower Kamchatka fortress (Nizhne-Kamchatsky ostrog) and building the ship "Gabriel-Archangel" there in the spring of 1728, Bering sailed straight to the north, passed through the strait that now bears his name, skirted Chukotka, and returned, since, due to foggy conditions, he had seen neither American coasts (which was his main task to accomplish) nor any islands (except those of St. Lawrence to the east of Chukotka, which he reached on 10/21.8.1728, and Diomid in the strait itself, Fig. 10). Thus, the question of mythical lands to the east of Kamchatka remained open. B.P. Polevoj (Polevoj, 1975, pp. 26–32) provides a detailed analysis of the problem caused by this error.[9]

In the summer of 1732, the sub-navigator Ivan Fedorov and the surveyor Mikhail Gvozdev used the ship "Saint Gabriel", which had survived from the Bering expedition, to examine the strait, and discovered the islands of Diomid, which turned out to be two different islands. They approached the American shore, where they saw the residential yurts, and subsequently discovered King Island. Fedorov died of scurvy in Kamchatka in February 1733, and his diary was discovered in 1741 in Okhotsk (Magidovič, 1967, p. 342).

[9]For the argumentation of this author and its critics, see: Bolhovitinov et al., 1997, pp. 53–57.

In St. Petersburg, Bering’s decision to sail to the north instead of the east, towards America, was recognized as a mistake that did not correspond to the instructions of the deceased Peter I. As a result, a decision was made to organize a new expedition.

6 The Second Kamchatka Expedition (1733–1743): the Delisle Map

The Second Kamchatka Expedition, also called the Great Northern/Siberian expedition, lasted more than ten years. More than 550 people were engaged in the exploration, while the auxiliary staff reached several thousands. In Arkhangelsk, Tobolsk, Yakutsk and Okhotsk, ships were built for the expedition, and the Tamginsky iron-making plant was erected for the same purpose at the banks of the river Tamga (now Tamma) near Yakutsk. The expedition consisted of nine teams: seven naval and one fluvial organised by the Admiralty College, and one academic land team run by the Academy of Science. The entire northern coast was divided into five areas, and each team had its own area of operation.

The academician Joseph Nicolas Delisle was entrusted with the preparation of the cartographic information for the expedition. In 1731,[10] he created the “Carte représentant la situation et la distance de la Tartarie Orientale iusquax < sic! > terres les plus voisines de l’Amerique < … > ”—a map of the northern part of the Pacific Ocean, and, in 1732, he presented the Senate with a “Note on three different ways by which it is necessary to follow the sea to discover what remains undiscovered” (Mémoire sur les trois différentes routes à suivre par mer pour découvrir ce qui reste d’inconnu) (Chabin, 1983, p.100). Delisle indicated the lands of Iezo (Izzo, Izu, Terre D’Eso), the island of the States (île des Etats), and the lands of the Company (Terre de la Companie) and of Gama (Terres vúes par Dom Iean de Gama) to the south of Kamchatka, and insisted on checking the veracity of these facts (Efimov, 1964, n° 78, p. 52). Unlike all the maps already mentioned, that of Joseph Nicolas Delisle was neither position-fixing, nor reporting, nor representative. This was a map designed for a specific task, and as such, it presented all of the issues that needed to be addressed. That is why only a deep misunderstanding of the situation can explain the assessment of it as an “incorrect map”.[11] If Delisle could have depicted everything in advance, an expedition would not have been necessary.

[10]There is a version of this map that is dated 1733.

[11](Lebedev, 1950, p. 98). Close in (Efimov, 1950, p. 164). In (Stepanov, 1968), this map, which was the basis for laying the Pacific expeditions route, was simply ignored. An interesting assessment was given to it in the “Brief Historical Outline” of the USSR Academy of Sciences, in which the authors tried to evaluate the activities of the academicians as positively as possible, but they did not understand the essence of the map: “In 1731–1732, on the charge of the Senate, he <J. N. Delisle - DG> compiled a map of Siberia and of the countries bordering it for the Second Kamchatka expedition, but it turned out to be very imperfect” (Komkov et al., 1977, p. 63). We have to admit that this is one of the most positive characterizations of this map in Russian

At the same time, Delisle's interests were quite different from those of the Tsar. He was not interested in the annexing and economic development of these islands, but rather in their location and mapping (although he himself raised the issues of ore deposits on them (Lebedev, 1950, p. 98)). However, Peter I's instruction, which the government was required to follow, and Delisle's interest as a geographer fully coincided with regard to the route of the Bering expedition, which was supposed to follow from southern Kamchatka not to the north, but to the east, reaching the American coast. In fact, Delisle insisted on completing the research programme set by Peter I eight years earlier on the identification of lands between Kamchatka and America and ascertainment of how close the continents fit in that place. The Senate only abolished (16/27.2.1733) the one point of Peter I's instruction that mandated sailing along the American coast up to the "European cities". Moreover, the new investigation of the strait between Chukotka and America was assigned not to Bering's team, but to another one, which was to make its way by navigating along the shore of the Arctic Ocean from the mouth of Lena to the east.[12]

7 In Search of Mysterious Lands: Losses and Discoveries

At the end of the summer of 1737, Bering arrived in Okhotsk, a settlement on the eastern shore of the Sea of Okhotsk. There, he founded a shipyard and started building ships for several teams.

Captain Martyn Shpanberg's detachment left Okhotsk in June 1738, on three ships: the howker "Archangel Mikhail", the double-sloop "Nadezhda" (Commander William Walton) and the deck-boat (Commander Alexei Shelting). By 1739, one more ship had been built in Bolsheretsk (Kamchatka). During 1738–1739, this detachment explored the Kuril Islands, went to the eastern shore of Sakhalin, and reached Japan.[13]

In 1740, the expedition founded a city in Kamchatka, on the shore of the ice-free Avacha Bay, where two 14-gun packet boats, the "St. Apostle Peter" (commanded by Bering himself) and the "St. Apostle Paul" (commanded by Alexei Chirikov), arrived from Okhotsk on 8/19.9.1740. They hibernated in the bay and, on 4/15.6.1741, ventured out into the ocean. The new city was named Petropavlovsk, after the ships. Presently, it is called Petropavlovsk-Kamchatsky and serves as the base of the Far Eastern fleet of Russia.

Bering and Chirikov went to the east, to America, in search of the Land of Gama. The team of the "St. Peter" counted among its members the naturalist Georg Steller, and that of the "St. Paul" the elder brother of Joseph Nicolas Delisle, Louis Delisle de Croyère. But by 20.6/1.7.1741, the packetboats had already lost each other because of the bad weather, and thus continued on separately. Delisle de La

historiography, except for the opinion of Andreev (1965, p. 69), who was perfectly aware of the problem.

[12]Divin, 1953, pp. 75–76, 80; Polevoj, 1975, p. 31.

[13]Efimov, ed. 1964, n°104–106, pp. 70–72; Magidovič, 1967, pp. 347–348; Čekurov, 1976, p. 73.

Croyère, relying on his brother's map, insisted on strict adherence to the initial task (which garnered a very negative reaction from the expedition members). As a result, they managed to determine that there was no vast "Terre de Gama", but also that, just above its hypothetical southern shores, there lay an entire archipelago (the Aleutian Islands), which the ships discovered on their way back. The exploration took a long time, and they reached the American shore only six weeks later, the "St. Paul" a day earlier than the "St. Peter". But Chirikov did not succeed in landing on the shore: the ships broke up on the reefs and fifteen people perished (or disappeared). They returned to Kamchatka in the autumn. Many participants died of scurvy; the rest merely became sick. Delisle de La Croyère died on the morning of 10/21.10.1741, just after the ship arrived in Avacha Bay; while going ashore, his heart apparently failed. As was stated in the logbook: "The Professor of astronomy de la Croyère died of the cruel scurvy desease" (Lebedev, 1951, p. 362).

Bering was more cautious: he navigated along the coast for four days until he found a safe place, which turned out to be the island of Kodiak (Kyktyk, in the local Qikertaq language). Steller, who took part in the landing, gave the first description of the nature of this part of America. On its way back, the "St. Peter" was less fortunate: on 4/15.11.1741, it was only able to reach an uninhabited island (now the island of Bering) that was part of the archipelago of four islands (now the Commander Islands—in honor of Captain Commander Bering). They remained there for the winter. On 8/17.12.1741, Bering passed away. At least thirty crew members had died of scurvy and exhaustion. Forty-six survivors, under the command of Lieutenant Sven Vaksel, managed to build a boat from the destroyed packet-boat and made their way to Kamchatka in August 1742.

8 The Disastrous Ecological Setbacks of the Discovery

The discovery of the Commander Islands brought about a real ecological disaster in this area. In autumn 1741, Steller discovered and described a previously unknown endemic marine mammal there, called Steller's cow (Rhytina stelleri). This gigantic relative of the dugongs, weighing up to 5 tons and reaching up to 7–8 m long, disappeared 27 years after its discovery: in 1768, fishermen killed the last specimen. In addition, the whole ecological system was destroyed. Algae, which were previously eaten by sea cows, began to grow, forming a dense thicket. As a result, the number of sea urchins, which constituted the main food for sea otters, decreased. The sea otters then left this area, having already been partly exterminated by the fishermen. Additionally, the hunting of fish became more complicated for Steller's cormorants, contributing to their extinction (they had completely disappeared by 1852). The dense thickets of algae also led to the stagnation of coastal waters and caused a rapid "red flowering" and "red tides" of multiple and very poisonous unicellular algae. Their poisons, including some that were even stronger than curare, accumulated in the body of mollusks and reached the fish, sea otters and birds along the food chain, leading to their death.

9 Back to Delisle's Maps

The Russian sailors (above all, Alexej Chirikov and Sven Waxel, who wanted to go north rather than east) were extremely unhappy with the mandate to search for the non-existent lands, believing that Delisle's map was the chief cause for all the expedition's misfortunes. According to his notes, published in a Russian version in 1940, Waxel first heard about the map at a meeting held on May 4 (anc.st.), 1741, in Avacha Bay, on the day he sailed into the ocean, but he did not understand its essence.[14] Later on, he wrote: " < … > the map mentioned was wrong and false, for otherwise we would have to jump over the land of Juan de Gama. In this map I find as much truth as in the news of the mythical country of Yezdo. It would, however, be more honest to first investigate in fact such unknown lands before widely informing sailing people about the discovery of the shores of the land of Yezdo or the land of de Gama < … > blood boils in me whenever I recall the unscrupulous deception caused to us by this wrong map < … > . Through the fault of this map, almost half of our team died in vain" (Waxel (Vaksel'), 1940, p. 56).

As a result, the death of Bering and of many other members of the expedition, including Delisle de la Croyère, was and still is routinely blamed on Joseph Nicolas Delisle.[15] K. Küntzel-Witt even concluded that his judgments "almost led to the failure of the Second Kamchatka Expedition" (Küntzel-Witt, 2008, p. 158), forgetting that the verification of existing hypotheses was one of the main goals of the expedition: it was necessary to check the existence of the lands depicted on Delisle's task map, and it was never intended that these pictures be used to lay other routes. The expert in the question, A. Andreev, who published Vaksel's notes, wrote that Delisle was the author of "the map of northeast Asia, which was given as a guide to Bering, and which was at one time considered by the participants in the voyage to the shores of America as almost the main cause of all their misfortunes. There is no need to point out the groundlessness of the accusations against this great scholar by his Russian contemporaries; they are well refuted in one of the works by Prof. Golder".[16]

If we consider the expedition as a whole, its materials subsequently served as a basis for the compilation of 62 maps of Siberia, Kamchatka, the North Pacific and the western coast of America north of California. They also contributed to establishing an inventory of the shores of the Arctic Ocean from Novaya Zemlya to Kolyma, and to collecting materials on the history, economy, flora, fauna, geology, climate and peoples of Siberia and Kamchatka.

Within this context, the story of Delisle's maps appears, at first glance, to be a local event. But seen from the perspective of the Pacific area, it is of paramount importance. The desire to blame the "wrecker" and the "French spy", as Joseph

[14]For this text by Waxel (originally in German) on the map and the meeting minutes of May 4, 1741, see: Bolhovitinov et al., 1997, pp. 54–56, 161–162; Divin, 1953, p. 128130.

[15]See, for example: Efimov, ed. 1964, p. 52; Gusarova, 2013, p. 129; Gusarova, 2016, pp. 341–342; Postnikov, 1985, p. 20; Fel', 1960, p. 176.

[16](Andreev, 1965, p. 69), with reference to: (Golder, 1914, pp. 183–184, 212–213).

Nicolas Delisle was—and is still—considered in Russian historiography, completely obscured the recognition of one of the most important geographical results of the Second Kamchatka Expedition: the fact that it contributed to the "erasing from the map" or discovery of prototypes of mythical or semi-mythical lands. It was found that the four lands—of Iezo, the States, the Company and Gama—are partly a fiction and partly a reflection of the presence in these waters of some smaller islands, such as the Kuril Islands and Sakhalin (the first three lands), or the Aleutian Islands (land of Gama). Thus, the vast Land of the Company is currently the most compact island, Urup, which belongs to the southern group of the Great Ridge of the Kuril Islands, whereas Yedzo (Iezo, Ezo, Esso, Edzo) is[?] the island of Hokkaido. But if the Kuril ridge was known earlier, the Aleutian archipelago (more precisely, the Commander-Aleutian ridge) was discovered by the Second Kamchatka Expedition, precisely in the course of the search for the land of Gama. They were supposedly the islands that Vasco da Gama's grandson had once been able to see, but had considered to be one big piece of land. And until the summer of 1741, it was not clear whether it was an island (and, if so, what size), a number of islands or a peninsula adjacent to the northern part of California. It turned out that the chain of islands—an archipelago, a ridge—adjacent to the mainland through the Alaska Peninsula is much further north of California. Such a discovery was equal to that of Alaska itself.

Instead, Delisle is accused of being responsible for Bering's death: "Delisle in 1747 < … forgot > about the recent death of Bering and his participation in it …" (Fel, 1960, p. 176); and his brother of possible sabotage: "Indications of this ignoramus and drunkard,[17] which, in fact, were not devoid of malicious intent, were, in all probability, mandatory for Bering" (Divin, 1953, p. 128). In other words, the "anti-Delisleans"[18] employed a conceptual substitution. In their opinion,

[17] This characterization dates back to G. Müller, who did not like Louis de la Croyère. Apparently, while travelling on a ship, the latter did actually consume a lot of alcohol to reduce scurvy pains: vodka tinctures on herbs are known as a folk remedy for scurvy.

[18] Paradoxically, such a position can be considered the standard position within the Soviet and Russian historiography of sciences. It has many supporters - L. S. Berg, V. V. Glushkov, E. V. Gusarova, A. V. Efimov, P. L. Kalmykov, D. M. Lebedev, A. L. Musikhin, A. V. Postnikov, S. E. Fel', and so on (see, f. ex.: Efimov, ed., 1964; Berg, 1946, pp. 128–129; Bogdanov et al., 2012, p. 91; Gluškov, 2007; Gusarova, 2013; Gusarova, 2016; Divin, 1953; Divin, 1952; Efimov, 1950; Efimov, 1971; Kalmykov, 2012; Küntzel-Witt, 2008; Lebedev, 1950; Postnikov, 1985). This situation was analyzed in our article from 2014 (Gouzévitch D., Gouzévitch I., 2014)). Concerning the Second Kamchatka Expedition, the position of this group is resumed by V. A. Divin: «French geographer and spy Joseph Nicolas Delisle, who served in Russia from 1726 to 1747 as a "scientific consultant," did much to falsify the history and significance of Chirikov's great discovery. In particular, he stole the diaries and the maps of the expedition of Bering and Chirikov and published a brochure in Paris entitled "Explanation of the map of new discoveries in the north of the South Sea" < … > . J. Delisle brazenly attributed the honour of the first discovery of northwest America to his brother Delisle de la Croyère, who was on Chirikov's ship, "St. Paul". This is all the more outrageous because the true role of Delisle de la Croyère was completely different: besides drinking heavily all he did was to greatly harm the Russian expedition. J. Delisle misled many scientists with his "works". That is why Voltaire, who used the materials of J. Delisle when writing the history of Russia from the time of Peter the Great, did not even name Chirikov"

Delisle, while preparing the task for the expedition, should have indicated the result that could, in truth, only become known once it was attained, whereas Delisle de la Croyère should not have insisted on the execution of the legal Senate directive. As for the members of the expedition, their grievances are understandable: they expended time, health and the lives of their comrades not on the discovery of new large lands, but on revealing their absence, that is, on obtaining a negative result. In science, this is also very much qualifies as a result, but it does not look so brilliant from the outside. They did not seem to consider the discovery of small uninhabited islands as compensation for their efforts. At the same time, it is obvious that there was a misunderstanding between the author of the research programme, the map compiler Joseph Nicolas Delisle, and the promotor of his ideas, Louis Delisle de La Croyère, on the one hand and the officers of the expedition on the other. Moreover, the Senate understood Delisle's arguments perfectly and, as we mentioned previously, gave instructions to implement his programme, which follows from the Senate decree of February 21, 1733.[19] We think that a very serious role in this misunderstanding between academics and navigators was played by the already mentioned and absurd secrecy. As follows from Waxsel's notes, the programme of the expedition was communicated to the navigators only on the day of departure, and before that, they could not even have imagined their role within it. A linguistic problem could also have played a part in the confusion, because, after an hour-long conference, the germanophone Waxel, who left written memories of it, and the francophone de La Croyère boarded different ships and never spoke to each other again in their lives, which means that one could get no explanations from the other. The true essence of the programme seems to have escaped Bering himself, since he did not even explain it to the officers of his own ship. For him, it was a kind of a non-negotiable order. Generally speaking, one can conclude that both of Bering's expeditions in reference to the Pacific involved a complete misunderstanding between those who set the tasks and those who carried them out. As for Chirikov, who, in 1728, together with Bering, passed fifty versts from the coast of America, without ever discovering it, he obviously dreamed of rushing north in pursuit of "fleeing glory". According to Chirikov's note of 1733, he was, at that time, perfectly aware of WHAT he and Bering had missed in 1728. He must also have understood this in the spring of 1741. It was enough to hear the rumours that were circulating about the expedition by Fedorov and Gvozdev in 1732. However, this expedition left no maps and, in this sense, was never completed. Thus, Chirikov could expect to be the first to map American shores. In addition, if the distance to another continent east of Kamchatka was completely unknown, the American coast

(Divin, 1953, p. 19). Every single bit of this passage deserves to be refuted here, but let us emphasize only two points, the most fantastic: Delisle, in principle, could not have stolen the diaries and the maps of the expedition of Bering and Chirikov, for the diaries were sent from St. Petersburg to Irkutsk in 1754 (Lebedev, 1951, p.27), when Delisle had already been living in France for seven years, whereas the maps remained in St-Petersburg. Additionally, Chirikov's name is mentioned with great respect seven times on 12 pages of Delisle's text (Delisle, Buache, 1752), and all claims for missing it must be addressed to Voltaire.

[19]The text is quoted in (Bolhovitinov et al. 1997, p. 161).

east of Chukotka was quite achievable in one round of navigation, and de La Croyère would not allow them to take all of the glory, forcing them to erase hypothetical lands from the map (or, conversely, to find small desert islands instead). Thus, those involved did have reason to be angry. The relationship between Delisle de La Croyère and the officers could hardly have been friendly in this situation. And if, under these conditions, the expedition carried out a programme aimed at erasing the "hypothetical lands" from the map, it is largely due to the perseverance of de La Croyère. In Russian historiography, it is recognized as an immutable fact that he got into the expedition "under the protection of his brother".[20] In this case, Joseph Nicolas knew what he was doing, and de La Croyère had done his scientific duty at the cost of his life.

Noteworthy is the fact that the land of Iezo, the island of the States, and the lands of the Company (the name itself is not specified) and Gama were also present on the general maps of Russia in 1733 and 1734 drawn by Ivan Kirillov (Fig. 11),[21] which confirms the prevalence of these views in that period. However, not one single reproach for this was addressed to Kirillov in Russian historiography, perhaps because of his Russian origins.

In 1745, the Academy of Sciences published the engraved "Atlas of Russia < … > ". Joseph Nicolas Delisle took part in its elaboration (together with Leonhard Euler, Gottfried Heinsius, etc.), and even presented it to the Academic Conference on 2/13.9.1745. The atlas included the "General Map of the Russian Empire" (Fig. 12), which radically changed the image of the territories in the Pacific area compared with the maps by Kirillov. According to the data from Spanberg and Walton, the Kuril Islands were depicted there, whereas the hypothetical lands disappeared. This means that the materials concerning this part of the expedition arrived in Petersburg in short order and reached the Academy of Sciences. But it is obvious that there were no other materials at the Academy, because the General map is cut off east of Kamchatka, but includes the portion to the west of the places where the Land of Gama should be found. The fact is that the reports of naval detachments were first delivered to the Admiralty College, where they were retained for a long time and, in some cases, never reached the Academy (Divin, 1971, p. 173; Efimov, 1958, p. 84).

The situation of permanent conflict in the Academy of Sciences prompted Delisle to leave Russia in 1747. But after the creation of the map in 1745, the Academy did not receive any new results. Previously, Delisle had obtained information from his brother. But after Delisle de la Croyère's death, this source dried up.

[20]Berg, 1946, p. 128; Divin, 1953, p. 97; Divin, 1971, p. 143; Lebedev, 1951, p. 26.
[21]Efimov, ed., 1964, n°71–72, pp. 48–49; Berg, 1946, pp. 172–173; Likhomanov, dir., 2010, p. 22.

Fig. 11 Ivan Kirillov. The Map of the Russian Empire. 1734

Fig. 12 The general map of the Russian Empire from the “Atlas of the Russia <...>”. 1745

10 Delisle's Provocation

Years passed, but nothing was published in Russia on the results of the expedition, and it was clear that this would continue: the Senate classified all the materials collected. For Delisle, this situation was a huge omission that deprived the scientific community of the most important information the trip had gathered, and so he undertook a deliberately provocative action.

On 8.4.1750, he attended a public meeting at the Paris Academy of Sciences and presented there a memoir entitled "Histoire abregée des nouvelles découvertes au Nord de la Mer du Sud", in which he set forth the results of the Second Kamchatka Expedition that he had in his possession. In 1752, together with the cartographer and publisher Philippe Buache, and despite the prohibition of the Russian Senate, Delisle published his famous "Carte des Nouvelles Découvertes au Nord de la Mer du Sud, Tant à l'Est de la Siberie et du Kamchatka, Qu'à l'Ouest de la Nouvelle France" (Fig. 13) with an explanatory brochure entitled "Explication de la carte des nouvelles découvertes au Nord de la Mer du Sud" (Delisle, Buache, 1752)—an essay in which the information about Bering's Second Kamchatka Expedition was published for the first time. The "erroneous" data in this essay were due to the fact that Russia had hidden the information obtained, including the refutation of the existence of "hypothetical" lands—that is, the results obtained by the ship "St. Apostle Peter" commanded by Bering. It is enough to see the General map of this expedition dated November 19, 1742 (Fig. 14), to understand that Delisle, who left Russia five years later, had no idea of it. That is why his essay and map of 1752 reflected all that was known in the world at that time about this area, plus his personal information relative to the trip of Chirikov with his brother on the ship "St. Apostle Paul" and to the exploration of the Kurils. As a result, Delisle believed that the "St. Apostle Paul" was the only one to have reached the American coast in 1741, whereas the "St. Apostle Peter", in his opinion, was wrecked at the Commander Islands on the way there. For this reason, the French cartographer did not present the path of this last ship on the map and, in addition to the materials received by the team of Spanberg-Walton, he depicted all four semi-mythic hypothetical lands on the map, placing them below the Kuril ridge.[22] However, we would refrain from evaluating this action by Delisle as a deliberate distortion or falsification of data, because, in order to distort something, one needs to know the real state of things. And this is exactly what Russia had carefully hidden. To make such a claim means to profoundly fail to understand the essence of the scientific communication of that epoch. It was hardly possible that Delisle could risk jeopardizing his name within the scientific community. The game was played on a much more subtle level: he had to provoke the anger of the Russians while remaining on top of the knowledge of his time. But to avoid his publication being missed or

[22]We do not wish to examine the questions dealing with J. de Fuca and B. da Fonte, whose doubtful travels were mentioned by Delisle. These questions are detailed by Efimov, who considers that Delisle's aim was to belittle Russian discoveries by replacing them with Spanish and Portugese ones (Efimov, 1950, pp. 200–207; Efimov, 1971, pp. 248–255).

Fig. 13 Joseph Nicolas Delisle, Philippe. Buache. Carte des Nouvelles Découvertes au Nord de la Mer du Sud, Tant à l'Est de la Siberie et du Kamchatka, Qu'à l'Ouest de la Nouvelle France". 1752

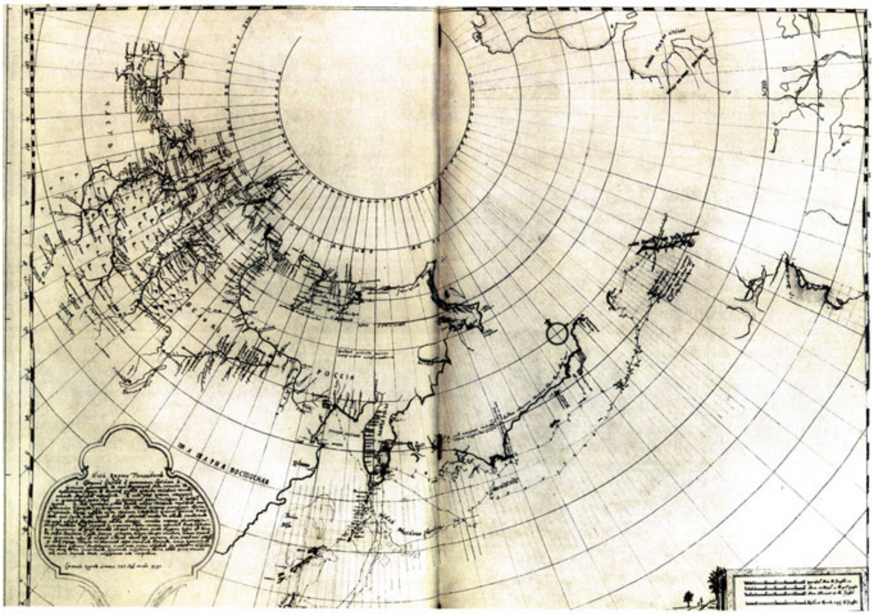

Fig. 14 The general map of the Second Kamchatka Expedition. 1742. Fragment

ignored in Saint-Petersburg, Delisle sent it to Russia himself, and the next year, he reissued the report, including the book "Nouvelles cartes des découvertes de l'amiral de Fonte et autres navigateurs espagnols, portugais, anglois, hollandois, françois & russes < … > ".[23] In 1753, Buache included Delisle's map in the Atlas "Considérations géographiques et phisiques sur les nouvelles découvertes au nord de la Grande mer, appellée vulgarement la Mer du Sud" (Likhomanov, dir., 2010, p. 24; Buache, 1755).

11 Secrecy as a Double-Edged Sword…

Before concluding, we need to evoke once again the problem of secrecy. In the world practice of the eighteenth and nineteenth centuries, there was an obvious dilemma: either a country formally announced its discoveries, and thereby consolidated new lands, or it hid this information, casting doubt as to whether they actually possessed it. In Russia, full realisation came very late, perhaps because the country had few marine discoveries—most of its discoveries were based on land, which no one but its own representatives could reach. However, during Catherine II's reign, the government became aware of the danger that threatened the eastern maritime borders because of the interest that France and Britain had revealed in this area. And it turned out that the secrecy of the previous half a century with regard to Russian discoveries and territorial acquisitions in the east was a double-edged sword that hurt Russia itself.

We doubt that Delisle sympathized with the Russian Empire, especially after he was dismissed from the post of professor of astronomy (full member) of the Saint-Petersburg Academy of Sciences in 1747 and deprived of the title of a foreign member in June 1748, with an accompanying loss of salaries. He acted in favour of the Republic of savants, seeking to disclose the results obtained by the Second Kamchatka Expedition. But, objectively, he acted in favour of Russia, helping it to consolidate the territories that it had discovered and to prevent possible encroachments on them by the great maritime powers.

12 The Russian Reaction

Both the map and the brochure caused a scandal. Thus, in March 1753, the President of the Saint-Petersburg Academy of Sciences, Count Kirill Razumovsky, entrusted one of its members, a former participant in the Second Kamchatka Expedition, Gerhard Friedrich Müller, to write a refutation. It was published the

[23](De L'Isle, 1753, pp. 11–18). The map for this book was printed in November 1752 and turned out to be a reprint of the map published in June with some corrections and a new title (Efimov, 1950, p. 201).

same year in Berlin in French and German as a "Letter from an officer of the Russian Navy to the court …", and the following year in London in English.[24]

The piece was so sharp-edged that Müller later regretted it (Pekarskij, 1870, p. 143), because he had placed emphasis "not on the priority of publishing scientific data, but on the professional inconsistency of J.-N. Delisle and, especially, of his brother, L. Delisle de la Croyère" (Ryčalovskij, 2007, pp. 237–238). However, Müller had cause to regret his pamphlet not only for ethical reasons, but also because of the reaction it raised within the European scientific milieu. According to A. Andreev: "The article, which contained many of Müller's attacks against Delisle and his late brother Louis, caused unflattering remarks abroad to the "officer of the Russian fleet", in particular from Philippe Buache, and the author of the letter, Müller, was obliged to return to the same subject in another, more consistent work, which should serve as an explanation for the map of discoveries. < … > . In 1754, the map of new discoveries was completed and made public under the title 'Nouvelle Carte des Découvertes faites par des Vaisseaux Russiens aux côtes inc onnues de l'Amerique Septentrionale avec les pais adjacents. Dressée sur les mémoires authentiques de ceux, qui ont assisté à ces découvertes et sur d'autres connoissances dont on rend raison dans un Mémoire separé. A St.-Petersbourg à l'Académie Imperiale des Sciences. 1754'".[25] The memoir mentioned in the title of the map was completed only at the beginning of 1756, when it was presented at the Academy Conference, and was published in 1758 in German (Müller, 1758(1)) and in Russian.[26] In 1761, the book was translated into English (Müller, 1761) (the second edition—in 1764), and in 1766, into French (Müller, 1766). As for the map, it was published in 1758 (Fig. 15), 1761, 1773 and 1784 (Likhomanov, dir., 2010, pp. 25–27; Müller, 1758(2)), although the later reissues contained some major adjustments to the outline of the American continent itself.[27]

The published map and the works by Müller clearly showed that none of the four hypothetical lands in the North Pacific exists, but that there were many small islands with specific coordinates and directions collected by the expeditions, leaving no

[24](Müller, 1753; Müller, 1754). The Russian text was published only recently (Müller, 2006). About the scandal, see also (Bagrow, 2005, p. 398; Berg, 1946, pp. 353–355; Divin, 1971, pp. 173–179; Efimov, 1950, p. 200; Fel', 1960, pp. 181, 191; Klein, 2002).

[25]'Novaja karta otkrytij, sdelannyh rossijskimi korabljami na neizvestnyh poberezh'jah Severnoj Ameriki s sosednimi stranami. Sostavlena na osnovanii podlinnyh zapisok teh, kto uchastvoval v etih otkrytijah, i na drugih dannyh, kotorye predstavleny v otdel'nom memuare' (Andreev, 1965, pp. 121–122). Figure 14, version of 1758.

[26]Contemporary reedition (Müller, 1996). As already noted above, due to secrecy, G. F. Müller himself, although a direct participant in the expedition, did not possess all of the information when drawing up the memoir that had been ordered by the authorities. According to M. Grenader, who studied the issue, "the shortcomings of Müller's work < … > were a consequence of the fact that the famous historian of Siberia did not use the journals of the expedition members" (Grenader, 1964, p. 103). A. Efimov notes that, when drawing up his final map of Russian discoveries in the Pacific, Müller was unable to access the most important map by A. Chirikov of 1746 (Efimov, 1950, p. 192); close affirmation in: (Efimov, 1958, p. 84).

[27]In 1781 and 1787, the totally new maps by P. Pallas and A. Vilbrekht had already been published, which take into account the results of the expedition of the Academy of Sciences (1781–1785), of Captain Cook and the others (Likhomanov, dir., 2010, pp. 40–41).

Fig. 15 G.F. Müller. 'Nouvelle Carte des Découvertes faites par des Vaisseaux Russiens aux côtes inconnues de l'Amerique Septentrionale avec les pais adjacents. <…> 1758

doubt about the fairness of these conclusions and securing the priority for Russian seafarers.

At the same time secrecy with respect to the Second Kamchatka Expedition greatly damaged Russia's image. It was believed that it concealed the possibility of sailing along the Northern Sea Route. There was no confidence even in the data published later by Russian navigators (it was assumed that they were deliberately distorted), until James Cook confirmed their accuracy during his third round-the-world voyage (1776–1779). Küntzel-Witt tends to consider this distrust as an example of disrespect for Russia, which many did not want to recognize as "an equal partner in the arena of great powers" (Küntzel-Witt, 2008, p. 161). We believe that this is the result of the secrecy within the field of Earth sciences, which Delisle tried to overturn.

Russia continued to proceed from the medieval notion that geographical secrecy provides security, and continued to hide its own geographical discoveries. Thus, the results of the expedition of P. K. Krenitsyn and M. D. Levashov in 1768–1769, which completed the discovery of the giant Aleutian arc, were buried in the archives. Some materials were not published until 1852, while others were only found in 1968. We can simply add that Krenitsyn and Levashov did not find their own Delisle.

As for the Second Kamchatka Expedition, a detailed analysis of the situation, with an extensive list of archival sources and a bibliography, was provided by Andreev (1965, pp. 118–137). Unlike in his case, the conclusions that can be found in the current historiography were provided by people who simply did not consult Delisle's book. Otherwise, how can we explain the statement by V. Glushkov that "Delisle published his work in Paris, in which the name of the captain-commander of the Russian fleet V. Bering was not mentioned at all, and the results of his second Kamchatka expedition were deliberately distorted" (Gluškov, 2007, p. 312), whereas, on twelve pages of Delisle's text (Delisle, Buache, 1752), Bering's name is mentioned sixteen times, and this is one of the earliest works in which it is mentioned? Simply put, Delisle missed some data because the information about Bering's navigation was carefully hidden.

If we proceed from Soviet toponymic publications, we have to acknowledge that Russia repaid the Delisle brothers for their perseverance in discovering the islands in the North Pacific with complete oblivion. In this area, there are nine geographical points bearing the name of Chirikov, thirteen that of Bering (including the sea and the river) and none that of Delisle (account according to (Maslennikov, 1986)).

In actual fact, the situation is a little better than that. In simple terms, the compilers of this fundamental guide, containing more than four thousand Russian registered marine geographical names, did not consider Delisle de La Croyère as a Russian scientist. The first person who bothered to perpetuate the name of this Frenchman in service to Russia was his compatriot, Jean François de La Pérouse, who sailed in this area in 1786–1787. He found the grave of de La Croyère in Petropavlovsk-on-Kamchatka and gave his name to the islands discovered near Alaska. However, La Pérouse died shortly afterwards, and a year later, these islands were rediscovered by the Englishman George Dickson, who, according to some reports, named them the "Misty Islands". So, this was the first time that the French astronomer's name failed to be fixed on this map of the earth. Now, neither one name nor the other can be found on the map.

Next was the Ostsee German Adam Johann von Krusenstern (alias Ivan Fyodorovich Krusenshtern). In 1805, fulfilling the will of La Pérouse, this traveller erected a monument to two people: the English captain, Clarke or Clerk (Charles Clerke) from the Cook expedition, and Delisle de La Croyère. He also named a small cape after the latter, accessible mostly from the sea, on the Eastern coast of Sakhalin Island, north of Cape Ratmanov, with coordinates: N 50° 48′ 10.82"; E 143° 40′ 5.26". Rare birds nest there, but Delisle de La Croyère never visited it.

13 Concluding Remarks

From 1731 to 1752, Joseph-Nicolas Delisle elaborated (No. 1, 3) or took part (No. 2) in the elaboration of three maps of the North Pacific:

(1) in 1731/33, it was a task-map, upon which the disputed territories were marked with a requirement to check their existence;
(2) in 1745, it was a general map of Russia, in which only the really open islands were depicted in the Far East, and the map itself was cut off east of Kamchatka, so that the disputed lands remained beyond its borders;
(3) in 1752, it was a provocative map that did not distort any Russian discoveries ***already known about*** by Delisle; however, this map did not include the information hidden by Russia, but rather put forward real or imaginary discoveries made by foreign explorers, with four hypothetical lands "fit into the corners" (in the full sense of the word) in order to force the Russians to answer all of these questions.

The Russian administration was caught in a trap, and, in Müller's pamphlet, all this was interpreted as distortions of reality and the result of the ignorance of Delisle and Buache. The latter attempted to react, whereas Delisle kept silent: the provocation achieved its goal, for, noting his mistakes and contesting him, Müller ended up presenting to the world all of that secret information that the French astronomer had been seeking to publish.

Abbreviations

L.	Leningrad
M.	Moskva
PSZ-1	Polnoe sobranie zakonov Rossijskoj imperii. 1e izd. SPb., 1830.
SPb.	Sankt-Peterburg

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A Corfiot Scientist in the Russian Empire: The Case of Nikephoros Theotokis (1731–1800)

Christine Phili

Abstract

Nikephoros Theotokis who was formed in Italy, constitutes an important figure of the Greek Enlightenment. Mainly by his 3 Volumes treatise, *Elements of mathematics* published in Moscow thanks to Zosimas brothers' generosity, offered to the enslaved nation a very modern manual for the teaching of mathematics. It might be stressed that in his Physics, as well as in the 3rd Volume of his *Elements of mathematics* he introduced differential and integral calculus in Greek.

Keywords

Nikephoros Theotokis · Academy of Iassy · Eugenios Voulgaris · Catherine the Great · Zosimas brothers · Greek Enlightenment · Elements of mathematics

1 His First Steps in Italy (1749–1752)

Nikephoros Theotokis was born on February 15, 1731, in the town of Corfu, when the Ionian Islands were under Venetian rule.

He started his studies with the erudite hieromonk Ieremias Kavvadias (1703–1781) (A. Tsitsas 1977–1978). In 1748, Theotokis was ordained as a deacon, but, as he was too young to perform his clerical duties, he left Corfu in 1749 to study philosophy, rhetoric, mathematics, physics, astronomy, and geography, first at the *gymnasium Patavinum* in Padua, (J. Tomasini, 1654) and later at the Academy of Bologna (Fig. 1).

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Fig. 1 Nikephoros Theotokis

ΣΤΟΙΧΕΙΑ
ΦΥΣΙΚΗΣ
ΕΚ
ΝΕΩΤΕΡΩΝ ΣΥΝΕΡΑΝΙΣΘΕΝΤΑ
ΥΠΟ
ΝΙΚΗΦΟΡΟΥ ΙΕΡΟΜΟΝΑΧΟΥ
ΤΟΥ ΘΕΟΤΟΚΟΥ.
ΘΩΜΑ ΜΑΝΔΑΚΑΣΟΥ,
ΤΟΥ ΕΚ ΚΑΣΤΟΡΙΑΣ.
ΤΟΜΟΣ Α.

Fig. 2 Elements of physics

In his book *Elements of Physics* (G. Vlachakis, 1987, 1991) (Leipzig 1766), Theotokis mentioned that among his professors were Giovanni Poleni (1683–1761) in Padua and Eustachio Zanotti (1729–1782) in Bologna, mainly at the Observatory (Fig. 2).

His two professors left their mark on Theotokis's education, as well as his career, as they both worked in the field of pure and applied sciences (Fig. 3).

Poleni was professor of astronomy at Padua; in 1715, he was assigned to the chair of Physics (G. A. Salandini- M. Pancino, 1988) and, in 1719, he succeeded Nicolas Bernoulli (1687–1759) as professor of mathematics. Given his expertise in

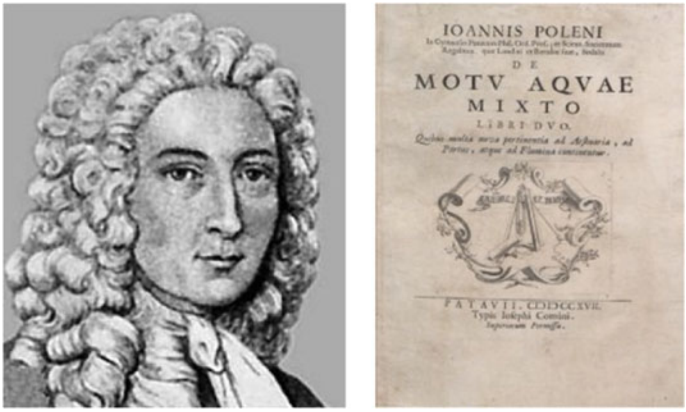


Fig. 3 Giovanni Poleni

Fig. 4 Jacob Hermann

hydraulic engineering, he was commissioned by the Venetian senate to construct a dam in the region of lower Lombardy. As he was highly esteemed for his research by the European scientific community, he was elected a Fellow of the Royal Society in 1710. In 1715, Leibniz proposed his nomination to the Berlin Academy of Sciences and, in 1739, Poleni entered the French Academy of Sciences.

It can be pointed out that Poleni was initiated into differential and integral calculus, as well as into Newtonian natural philosophy, thanks to the lectures (1707–1713) held by the Swiss professor Jacob Hermann (1678–1733) (E. Fellmann, 1969), one of

Fig. 5 Eustachio Zanotti

Jacob Bernoulli's pupils and a member of the Berlin Academy since 1701, who, in 1707, was appointed to a chair of mathematics in Padua.

Poleni's knowledge (A. Ghetti, 1992) of hydraulics and dynamics is reflected in his correspondence with Jacopo Riccati (1676–1754) (Fig. 4).

Eustachio Zanotti, the second professor who played an important role in Theotokis's destiny, was educated by the Jesuits, and later studied at the University of Bologna, becoming E. Manfredi's (1674–1739) assistant at the Institute of Sciences in 1729. In 1730, he was appointed as a lecturer in mechanics and, in 1739, succeeded Manfredi as director of the Observatory, one of the most famous in Europe. In 1760, he taught hydraulics at the university and, in 1776, restored Gian Domenico Cassini's sundial in the church of San Petronio (F. Guarducci 1925) (Fig. 5).

At that time, Theotokis had the privilege of attending lectures[1] on mathematics, physics, astronomy and geography, i.e., the new quadrivium, as well as the opportunity, as he revealed in his *Elements of Physics,* to observe solar and lunar eclipses under Zanotti's guidance.

2 Returning to Corfu

On his return to Corfu in 1752, he devoted himself to educating his young compatriots, free of charge, as their lack of learning made this task imperative to him. Thus, with his former master, Ieremias Kavvadias, he founded a school (in Greek, *φροντιστήριον,* a common seat of learning) that, in reality, had the same function

[1]However, we consider that, during his sojourn in Italy, he also attended lectures on medicine, as many references to medical books appear in his treatise *Sermons on Great Lent* ….

Fig. 6 Map of Corfu

as a secondary school. The curriculum of that school was supported by Federico Brocchieri and Abbot Martini, who taught Latin and Greek grammar, respectively. Kavvadias taught metaphysics[2] and Greek literature (*precettore di belle lettere)* and, naturally, Theotokis was given the task of teaching mathematics (i.e., geometry, conic sections and algebra), physics and geography (Fig. 6).

It is worth noting that Theotokis was the first, after the Byzantine period, to introduce conic sections into the curriculum.

The students who attended that school were mainly from Corfu, and their ages varied from 8 to 40 years old. Side by side with his teaching, Theotokis prepared for and took his vows and, in 1758, he was appointed parish priest in the Church of Saint John and Agia Paraskevi.

[2]I. Kavvadias taught metaphysics from the book by Edme titled *Pourchot, Purchotius, (1651–1734). Institutio philosophica ad faciliorem veterum ac recentiorum philosophorum lectionem comparata.* Paris 1695. *1er Volume translated in ancient Greek). «Il secondo (maestro) è il Monaco grego Pre Geremia Kavadia nativo di Purcozio tradotta in greco litterare». Archivio di Propaganda Fide.* Scritture riferite nei Congressi. Greci t. 3, f. 238 v.

Fig. 7 A. M. Capodistria

However, the Catholic Church frequently voiced its disapproval of his school. The Latin archbishop, Antonio Nani, complained to the authorities in Corfu because Theotokis did not mention the “filioque” in the creed. It must be noted that, in the Orthodox Church, it is only acceptable that the Holy Spirit be said to descend from the Father, God, and not from the Son, Jesus.

In fact, the Catholic Church’s interference created great difficulties for this school, in spite of its being attended by many students, among whom, we may recall, were Antonio Maria Capodistria, Ioannis Capodistria’s father, and Chrysanthos of Aitolia, who would go on to graduate from the Great School of the Nation in Constantinople (Fig. 7).

During this period, Theotokis showed evidence of his knowledge of hydraulic engineering, acquired from his Italian teachers, in his work to ameliorate the port of Gouvies in Corfu.

3 The Voyage to Constantinople and the Directorship at the Iassy Academy

The fame of Theotokis’s school, as well as his qualifications, attracted the attention of Ioannikios (1761–1763), the ecumenical patriarch, who invited him to become headmaster of the Athonian Academy, which had been inactive since Voulgaris’s departure in 1761.

Fig. 8 Gregorios Ghikas

Theotokis eagerly accepted this invitation and left Corfu for two main reasons: the confrontation with the Catholic Church and the need to publish his first treatises.

In Constantinople, he had the opportunity to become close friends with the Fanariot nobleman Gregorios Ghikas (1724–1777), who, in 1764, was appointed governor (hospodar) of Moldavia. As the project of the revival of the Athonian Academy had failed, Theotokis accepted Ghikas's invitation, traveling to Iassy in order to take over the directorship of that Academy. Using a simpler form of language, Theotokis established the teaching of contemporary mathematical and physical sciences there, an initiative that was in the vanguard of his day (Fig. 8).

His sojourn in Iassy was very brief, and the true causes of his departure remain unknown. His lectures may have been too advanced, inciting an adverse reaction on the part of the élite. Theotokis is, however, known to have said that he had left Iassy in favour of Leipzig, where he intended to have his book on Physics published, as he quickly came to understand that the lack of textbooks had contributed to making his teaching problematic (Fig. 9).

4 Leipzig—Constantinople—Vienna

His sojourn in Leipzig was successful, as he was able to publish three books[3] and had the opportunity to attend the lectures of Heinrich Wingler (1703–1770), a professor of ancient Greek, Latin and physics at Leipzig University, who was,

[3] *Sermons on Great Lent… Leipzig (1766); Elements of Physics* 1st Vol. Leipzig 1766; 2nd Vol. Leipzig 1767.

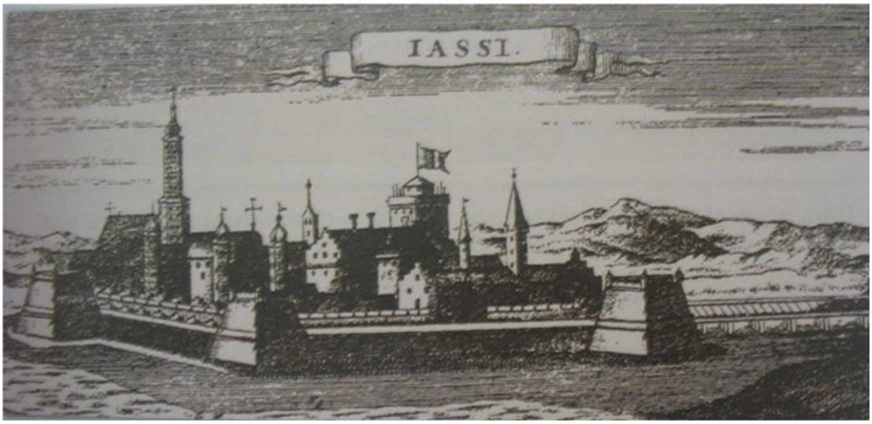


Fig. 9 Old engraving of Iassy

Fig. 10 Map of Leipzig

moreover, a member of the Royal Society and belonged to Christian Wolff's circle (Fig. 10).

From Leipzig, he returned to Constantinople. Once again, he accepted Ghikas's hospitality, becoming his son's tutor. Theotokis took advantage of this period to study in the rich library of his amphitryon and could not resist Ghikas' new invitation to become director of the Iassy Academy in 1774.

In his second mandate, Theotokis was more mature and more competent. He had attended lectures and experiments at Leipzig University, his book on physics had been published[4] and he had the opportunity to study the latest books regarding mathematics, astronomy and physics. Thus, through his teaching at the Iassy Academy, he introduced his students to the modern trends of science.

However, it seems that his teaching caused provocation in conservative circles. As his lectures on the "new philosophy" diverged from the traditional view, as far as they were concerned, none of his new curriculum could be considered reliable.

Theotokis left Iassy abruptly and settled in Vienna, where a wealthy Greek community flourished. There, he gave lessons as a private tutor. One of his students was the hieromonk Anthimos Olympiotis (1737–1794), a former student of Voulgaris's at the Athonian Academy who later revealed that Theotokis had introduced him to rhetoric and algebra.

However, it should be pointed out that, during his sojourn in Leipzig, Theotokis revealed that he was aware of the Russian geographical expedition on the eastern shores of Siberia.

This can be understood more precisely by reading his letter (I. Sakkelion, 1890), dated October 30, 1773, to the erudite hieromonk Neophytos Kausokalyvitis (1713–1784), former director of the Athonian Academy, in reply to his questions concerning the discovery of America.[5] Thus, among other pieces of information, he stressed that when Krasheninnikov[6] and Steller[7] arrived at Kamtchatka's peninsula and observed that the distance between Kamtchatka and America was very short, they put forward the hypothesis that the first inhabitants of America were Kamtchatkians.

It is extraordinary that, in spite of his heavy workload, Theotokis could find the time to study Kamatchatka's geographical expedition. Professor Makridis considered that, as Theotokis was not able to read Krashninnikov's treatise in Russian, he most likely studied it in translation.[8]

Two years later, in October 1775, he received an unexpected letter from his compatriot Evgenios Voulgaris (1716–1806), Archbishop of Sloviansk and Cherson, sealing Theotokis's destiny to live and die in the Russian Empire (Fig. 11).

[4]It should perhaps be stressed that, in this treatise, he introduced in Greek the use of derivatives and integrals, although he avoided using the symbol of the integral (G. Vlachakis, 1991).

[5]After Colombus's discovery, many theological questions had arisen, such as, for example: if the Americans originated from Adam and Eve, or if Noe's cataclysm took place in America, etc.

[6]It concerns Stepan Petrovich Krasheninnikov (1711–1755), a member of the Academy of Sciences of St. Petersburg. See *The description of the land of Kamchatka (Opissame Zemli Kamichatki)* 2 Vols Imperial Russian Academy of Sciences. St. Petersburg 1755. For more details, see V. Makridis, «Amerika as theological problem during the Neo-hellenic *Enlightenment» Eoa και Esperia.* Vol. 2 1996, pp. 9–70.

[7]In his paper, Professor V. Makridis notes that Georg Wilhelm Steller (or Stöller) (1709–1746) was a distinguished theologian and botanist who made various geographical investigations between the two Siberian rivers Yenisei and Lena; see V. Makridis, *op. cit.,* p. 46.

[8]Mr. Kracheninnikow, *Histoire et description de Kamtchatka* … t. I. Amsterdam 1752 traduit du russe par M.. de Saint-Pré.

Fig. 11 Evgenios Voulgaris

5 Russia: His New Destiny

In his letter, Voulgaris stressed the spirit of liberty that reigned in Russia thanks to the privileges granted by Catherine the Great (1729–1796). Thus, Russia constituted a safe refuge for the unfortunate Greeks, Vlachians, Moldavians, and Serbs. This invitation arrived at just the right time, as Theotokis was feeling depressed as a result of all of his roaming around European cities. He accepted this invitation, although his inability to speak the Russian language constituted a real disadvantage (Fig. 12).

What made Russia a kind of paradise for the enslaved Greeks? It must be said, as mentioned above, that this favorable atmosphere was created by the empress. A series of diplomatic successes, such as, for example, the treaty of Teschen (1779), the implementation of the Armed neutrality (1780), and the annexation of Crimea (1783), strengthened Catherine's ambitions, which caused her to envision Russia as the heir not only to the Byzantine empire, but to Ancient Greece, too. Within this

Fig. 12 Catherine the Great

framework, the *"Greek project*[9]*:* was conceived and elaborated, and it was this plan[10] that first led her to send an invitation to Evgenios Voulgaris (Fig. 13).[11]

In order to underline this affinity with Byzantine, Catherine the Great chose for her grandson[12] (1779–1831), the name of Constantine, Emperor of the Eastern Roman Empire, a name that had never before been used among the members of the Romanov dynasty. Thus, we may deduce that her *"Greek project"* took shape in 1779, the year of Constantine's birth (Fig. 14).

[9]This project has its roots in the epistle of the Grand Prince Vassily III, son of Ivan III and Sophia (Zoi) Palaiologou, who proclaimed that Moscow was the third Rome: *"For two Romes have fallen, but the third stands and there will never be a fourth"*. W. van den Bercken, *Holy Russia and Christian Europe. East and West in the Religious Ideology of Russia.* London SCM Press 1999, p. 146.

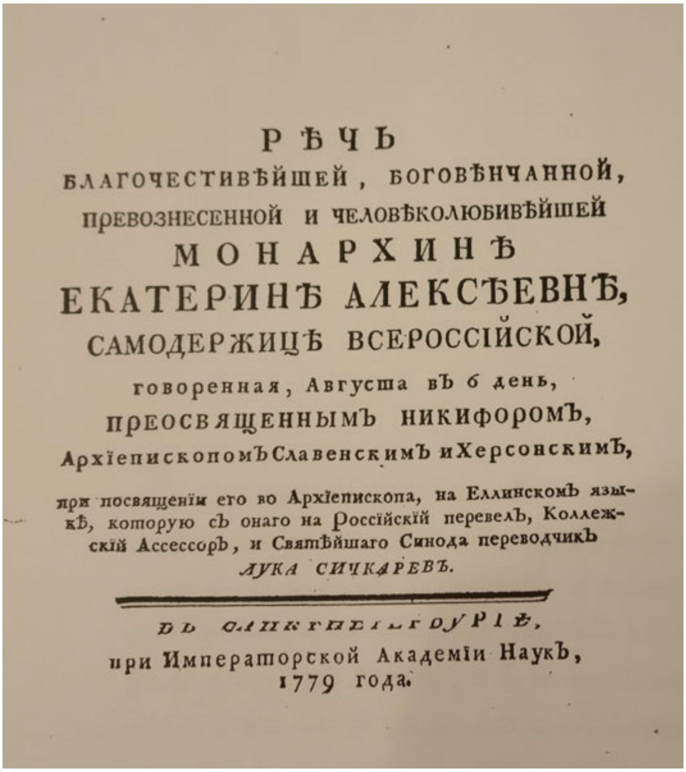
[10]Catherine, supported by Voulgaris, established a school in order to assimilate those Greeks who had supported her country in the recent war against the Ottoman Empire into the Russian army, navy, administration and diplomatic service. This School became the well-known Greek gymnasium, the curriculum of which was extraordinary, as the students studied theology, mathematics, history, and geography as well as Russian, Greek, Turkish, Italian, German or French.

[11]St. K. Batalden, *Catherine's Greek prelate Eugenios Voulgaris in Russia 1771–1806.* New York 1982.

[12]Catherine the Great desired to endow her grandson with a truly Greek identity, and thus demanded that he learn the Greek language; moreover, in order to commemorate Constantine's birth, a medal was struck, with one side showing the bust of the empress in profile, and the other the figures of the three Graces, Faith, Hope and Charity, standing on the shores of the Bosphorus. Her vision of the throne of Constantinople is depicted as the cathedral of God's Wisdom (Agia Sophia), which appears behind the figure of Faith.

Fig. 13 The commemorative medal for Prince Constantine's birth

Fig. 14 Prince Constantine


РѢЧЬ
БЛАГОЧЕСТИВѢЙШЕЙ, БОГОВѢНЧАННОЙ,
ПРЕВОЗНЕСЕННОЙ И ЧЕЛОВѢКОЛЮБИВѢЙШЕЙ
МОНАРХИНѢ
ЕКАТЕРИНѢ АЛЕКСѢЕВНѢ,
САМОДЕРЖИЦѢ ВСЕРОССІЙСКОЙ,
говоренная, Августа въ 6 день,
ПРЕОСВЯЩЕННЫМЪ НИКИФОРОМЪ,
Архіепископомъ Славенскимъ и Херсонскимъ,
при посвященіи его во Архіепископа, на Еллинскомъ языкѣ, которую съ онаго на Россійскій перевелъ, Коллежскій Ассессоръ, и Святѣйшаго Синода переводчикъ
ЛУКА СИЧКАРЕВЪ.

ВЪ САНКТПЕТЕРБУРГѢ,
при Императорской Академіи Наукъ,
1779 года.

Fig. 15 The front page of Theotokis's speech of August 6, 1779

We do not know the exact date of Theotokis's arrival in Russia; however, we presume that he arrived sometime in the period between 1776 and 1777. First, he was appointed to the archiepiscopal council of Poltava. During his two years' stay in Poltava, Theotokis enhanced the Poltavian Seminary,[13] founded by Voulgaris. He improved the curriculum by including Greek, French, arithmetic and drawing.

After Voulgaris's resignation, Theotokis succeeded him and, on August 6, 1779, his ordination took place in Saint Petersburg in the presence of the Empress and her court. The ceremony was celebrated by Archbishops Gavriel of Novgorod and Innokenti of Peskov (Fig. 15).

During this ceremony, Theotokis addressed the Empress by making a memorable speech in which, besides expressing his gratitude and respect, he paid tribute to her political and legislative work through his mention of the military intervention

[13]In a letter to the Greek community of Taganrog, Theotokis encouraged parents to send their children to the Greek gymnasium of Saint Petersburg or to the Poltavian Seminary. Among the students who attended the lectures at the Slavonian hieratic school in Poltava were Alexandros Mavrokordatos (1754–1819) and Athanassios Psalidas (1767–1829).

against the Ottoman Empire[14] and the protection of the Orthodox people. Finally, he dared express the desire to liberate the enslaved Greeks by means of "*the Greek project*".

By mentioning this project, Theotokis lent a political and national nuance to his speech, since its aim was the liberation of the Greeks and the establishment of a state under the rule of a Romanov descendent.

We cannot be certain that this initiative was dictated by his mentor Voulgaris, who, a few years earlier, during the ceremony for his enthronization as archbishop, had expressed his desire to see the empress on the thrones of both Russia and Greece (N. Iu. Bolotina, 2008).[15]

It was in Russia that Theotokis masterfully revealed his skills. In his first years as archbishop, he tried to fulfill his pastoral duties. An instance of this was to be seen when the inhabitants of Tangarog demanded the foundation of a Greek church, and Theotokis took it upon himself to satisfy their request. He also managed to bring back many old believers (raskolniki) to the church, as well as converting a number of old Muslim Tartars to Orthodoxy.

On April 16, 1792, he resigned from his office, having decided to live as a monk in Moscow in the monastery of Saint Daniel.[16]

Although the new tsar, Paul I (1754–1801), was in permanent conflict with his mother, he honored Theotokis with the order of Saint-Anna.[17]

During the last years of his life, Theotokis concentrated on publishing his works, among them, the *Elements of Mathematics*.

He died (G. Theotoki, 1802) in the Saint Daniel monastery on March 30, 1800.

6 Theotokis's Mathematical Treatise Edited in Moscow

During the last years of his life, 32 years after the publication of his *Physics,* Theotokis found the opportunity in Moscow to publish his treatise, *Elements of mathematics compiled from Ancients and Contemporaries…,* which, in truth, constitutes a well-ordered textbook based on his previous teaching mainly at the Academy of Iassy.

[14]Such as, for example, the campaign (1769–1778) of Admiral Alexei Orlov. This revolt constituted a part of the tzarine's so-called *"Greek project:*. For the Russian navy, this campaign was successful and led to the treaty of Kuchuk-Kainarji. Unfortunately, for the enslaved Greeks, it was a disaster.

[15]N. Iu. Bolotina, «Grecheskii prosvetitel' E. Voulgaris pri dvore Ekaterine II» in *E. R. Dashkova i predstaviteli veka prosveshcheniia,* red. Koll. L. V. Tychinina (otv. red), A. V. Semenova, N. V. Bessovrabova. Moskva M. G. I. E. R. Dashkovoi 2008, pp. 97–98.

[16]This monastery was founded by Saint Prince Daniel (1261–1303) of Moscow, son of the Saint, Prince Alexander Nevsky. In 1930, the bolsheviks closed it and the graves were destroyed.

[17]The motto of the order is *"Amantibus Justitiam, Pietatem Fidem:* (to those who love justice, piety and fidelity).

The peculiarity of this treatise is that it has two prefaces and two dedications. The first preface was written by the editors and two wealthy merchants, the Zosimas brothers,[18] who expressed their acknowledgment, as well as their thanks to the teachers of the Nation, i.e., to Methodios Anthrakitis,[19] Balanos Vassilopoulos[20] and the latter's son, Kosmas Balanos.[21]

In pointing out the paucity of mathematical tradition and the lack of mathematical treatises, the Zosimas brothers believed that their generous offer could increase scientific knowledge.

On the second page, Theotokis presents his dedication to the young students. The dedication is, in fact, a fragment from the *Wisdom of Sirah,* which stressed his conception regarding the compatibility of Science with faith.

> My son, listen to me, learn knowledge
>
> and heed my words with your heart.[22]

In his second dedication, addressed to the Zosimas brothers, he praised their contribution to the publication of the book and their generosity in offering their fortune to establish schools, mainly in Ioannina. Theotokis explained the reason for this offer, which was based on the neglected role of mathematics in the curriculum. He believed that the main reason was the lack and inaccessibility of mathematical treatises. This deficiency was to be remedied with the publication of his book (M. Terdimou, 2003; A. Tsigoni, 2005).

The title of this treatise, *Elements of Mathematics compiled from Ancients and Contemporaries …*, reflected Theotokis's aim, which was to stress the amalgam of ancient Greek inheritance, as well as the contemporary European trend. In the introduction addressing the readers, he stated that "*when we speak about Geometry, we don't exclusively consider Euclid's Elements, because these constitute the key to*

[18]The Zosimades or Zosimas brothers were Greek benefactors and merchants, hailing from Ioaninna (Epiros), an important center of the Greek Enlightenment. There were six of them, including Ioannis (1752–1771), Anastasios (1754–1828) and Zois (1764–1828), who established their trade business first in Nizhyn and later in Moscow. They supported the publication of 3,000 Bibles by the Imperial Russian Bible Society (Ts GADA, fond 1184, opis' 2, delo 3472, 11.1.5). They put up critical amounts of money in order to establish various schools and public libraries. As active members of the Society of Friends (Philiki Etaireia), they contributed to the war of Independence (1821–1830). In 1799, they gave financial support for the publication of many books in Moscow, including Theotokis's treatise.

[19]Methodios Anthrakitis (1660–1736) was a Greek Clergyman, theologian and mathematician who studied in Venice, where he attended lectures on philosophy and mathematics. His main work is *Road to Mathematics* …, which was later elaborated upon by his student Balanos Vasilopoulos, who published it in 4 Volumes in Venice in 1749.

[20]Balanos Vasilopoulos (1694-ca. 1760) was a clergyman, teacher and scholar celebrated for his mathematical treatises, including a concise exposition of arithmetic. Venice 1803. He tried to prove the quadrature of the circle (Vienna 1816).

[21]Kosmas Balanos (1731–1808) was a clergyman, writer and scholar born in Ioannina. In 1756, he succeeded his father at the School of Giouma in Ioannina. His books, *Concise exposition of arithmetic, algebra and chronology* (Vienna 1798) and *Antipelargisis* (Vienna 1816) were published through the financial support of the Zosimas's brothers.

[22]*Wisdom of Sirah* 16. 24.

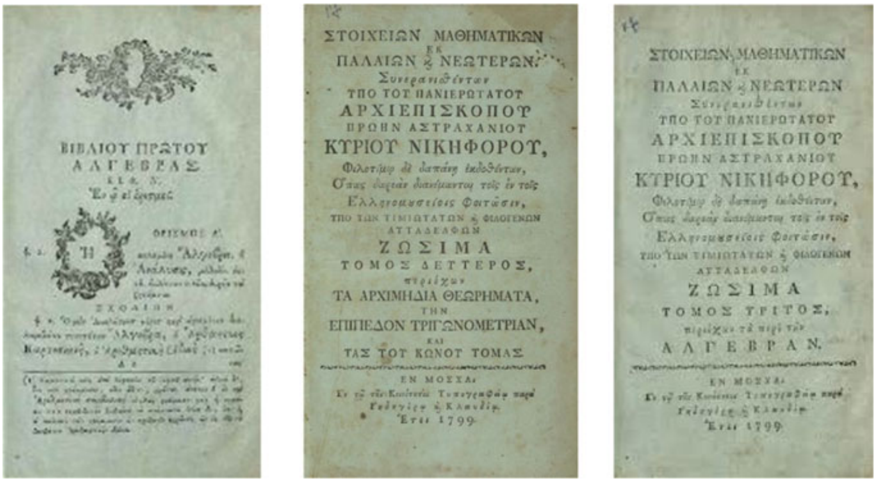


Fig. 16 The three volumes of the elements of mathematics …

open the door of higher mathematics, i.e., arithmetic, Trigonometry, Archimedes' theorems, conic sections, Analysis and so-called Algebra" (Fig. 16).[23]

So, according to the widely held European definition, the term "Geometry" covered all branches of mathematics, a definition that survived until the first half of the 19th century; as a consequence, a "geometer" was synonymous with a "mathematician".

In his preface, he underlined the value of mathematics by quoting the inscription over the entrance to Plato's Academy "*Let no one ignorant of geometry enter here*". He also referred to Xenocrates, who expelled those students who were ignorant in geometry.

From the very beginning, Theotokis sustained the prominent role of geometry as he supported Galileo's statement,[24] i.e., that the language of nature is written in both mathematical terms and its symbols, the latter of which are triangles, circles and other geometrical figures. Theotokis, therefore, explicitly described the other geometrical figures: parallelograms, parabolas, hyperbolas, ellipses, spirals, pyramids, cubes, cylinders, and spheres. Moreover, he posed the question, following Galileo's conception, regarding the impossibility of understanding nature while its elements remain unknown.

Furthermore, he emphasised the necessity of geometry in order to understand the branches of astronomy, mechanics, architecture, optics, hydraulics, and navigation, as well as the four Empedoclian elements: earth, water, fire, air.

[23]Nikephoros Theotokis, *Elements of Mathematics…* To the readers p. iβ′.
[24]G. Galileo, *Opera Omnia. Il Saggiatore.* Vol. IV, p. 17.

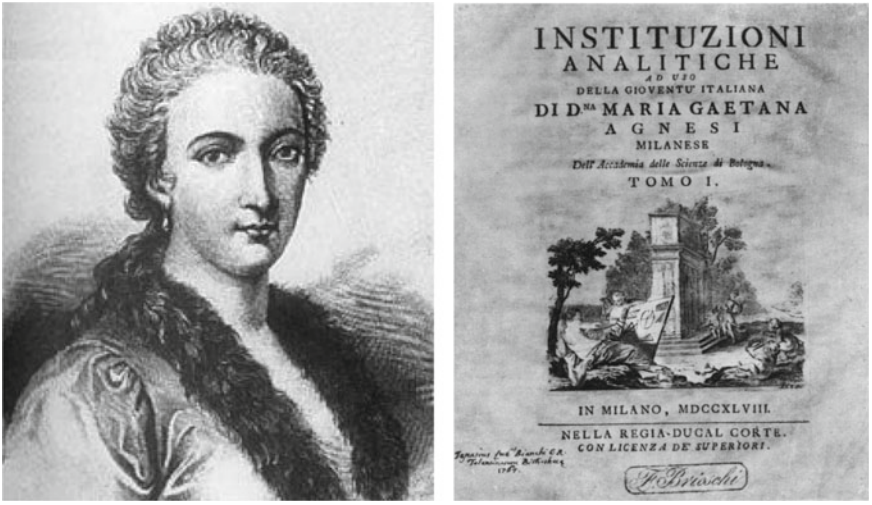


Fig. 17 M. G. Agnesi and the front page of her work

In line with this point of view on geometry, he stressed that, as the ancient Greek treatises of Euclid, Eudoxus, Geminus, Marinus, Archimedes, Apollonius, Ptolemy, Pappus, Diophantus and others were very complicated, he intended to present their work in a simpler and more understandable language.

On the progress of geometry, Theotokis once more revealed his Italian background, as he made references to the prefaces of Taquet's *Geometry*[25] and Vincenzo Riccati's *Algebra*.[26]

Ending his preface *To the Readers,* he indicates that he had tried to simplify the proofs of the theorems by making them shorter, and once again underlined his debt to Italian scientists: "*Some Chapters are taken from our Italian masters*"[27] [N. Theotokis, Elements of Mathematics.. Vol. III, p. 233], and concluded that his enjoyable, intelligible treatise would contribute to the promotion of other sciences (Fig. 17).[28]

The first volume contains the I, II, III, IV, V, VI, XI and XII books of Euclid's *Elements*, based mainly on A. Tacquet's treatise *Elementa euclidea geometriae*. The second volume starts with Archimedean theorems and ends with Apollonius' *Conics*, to which Theotokis had previously referred. It must be said that this volume

[25]A. Tacquet, *Elementa geometriae.* Antwerp 1654.

[26]V. Riccati, *Opusculorum ad res physicas et mathematicas pertinentia.* 2 Vols Bologna (1757–1762).

[27]As he revealed on p. 233 of the 3rd volume Theotokis studied the well-known treatise of that epoch by M. G. Agnesi, *Instituzioni analitiche ad uso della gioventud italiana.* Bologna 1748.

[28]The Corfiat archbishop stressed that mathematics is indispensable for philosophy too, as it contains difficult concepts that require a well-structured and trained mind, which only mathematics could provide.

constitutes the very first neo-Hellenic treatise devoted to the theory of conic sections.

Although Theotokis based his treatise on the work of the ancients, he nevertheless dealt with modern theorems. Thus, on page 198, he pointed out a new property of hyperbola unknown to the Ancient Greeks, namely, that the area between an orthogonal hyperbola and its asymptotes is infinite, stressing that this property belonged to Grégoire de Saint-Vincent, and he quoted from the latter's treatise "*Opus Geometricum quadraturae circuli et sectionum coni, edited in Antwerp in 1647*"[29] [N. Theotokis, op.cit., Vol. II, p. 198].

In this chapter, he yet again revealed his affinity for the Italian scientists. More precisely, in a footnote to page 208, he referred to one of Torricelli's "theorems", i.e., the volume of the solid generated by an orthogonal hyperbole in revolution is finite. He emphasized that this property was established by "*one of Galileo's pupils, Toricelli from Faenzia, whose life ended in 1647*" [N. Theotokis, ib.].

However, although Theotokis' references demonstrated his familiarity with the well-known treatises of Grégoire de Saint-Vincent and Torricelli, while working in the library of the Romanian Academy, Professor Karas (Y. Karas, 1992) found a manuscript of Theotokis' lectures in which he revealed that he had also taken into consideration the book by the Benedictine monk Giuseppe Orlando (1712–1776) on conic sections.[30]

The third Volume contains higher Geometry and the Method regarding the infinites.

According to Theotokis, the teaching of higher Geometry included the study of conic sections and other curves, which were not part of elementary Geometry.

Moreover, he distinguished two branches of analysis, the first of which involved determined quantities, which he called Algebra[31] or Cartesian Arithmetic,[32] and the second of which dealt with undetermined or infinitesimal quantities that constitute the integral or the differential, or Newtonian algebra.[33]

He began the chapter regarding differential calculus or infinitesimals, after defining constant and variable quantities, by presenting the quantities that can be neglected in algebraic transformations without any effect on the result, because every such quantity is like a disappearing "*fragment of dust that cannot modify the height of a mountain*", and, according to the tradition that appeared in manuals up to the end of the 18th century, Theotokis named these new quantities "differentials" or "fluxions" or "infinitesimals", stating that such quantities could be added or

[29]N. Theotokis, *op. cit.,* Vol. 2, p. 198.

[30]*Sectionum conicarum Tractactus selectas earundem ex Vateribus & Recentioribus Geometris proprietates contineus, & in hac Nova Geometria. Editione in gratiam studiosae Juventutis editus D. Josepho Orlando.* Napoli 1744.

[31]According to his *Encyclopedia* ..., Jean le Rond d'Alembert often presents analysis and algebra as synonymous.

[32]Cartesian arithmetic means the use of Descartes' analysis in order to discover, without the aid of differential calculus, the properties of geometric lines, i.e., analytic geometry.

[33]As Theotokis did not opt for Newtonian or Leibnizian notation, he utilized this term in an improper way, as Newton defined "fluxion" as the instantaneous rate of change at a given point, i.e., the time derivative.

removed without any effect on the final result. In order "to accomplish rigor" in his exposition of "Newtonian algebra", claiming to follow Newton, Theotokis accompanied his operations with differentials using the language of Euclidean geometry, which made his exposition very heavy.

Continuing his presentation, he gave the definition of the 2nd order infinitesimal, as well as the definition of an infinite quantity, and it is worth noting that said definition, that of an infinite quantity that has no limit, recalls the first definition in Book I of Euclid's Elements: *«a point is that which has no parts».*

After the definition of differential and integral calculus, he presented the rules of the sum, product, and quotient of infinitesimals, i.e.,

$$\chi + \psi + \omega \Rightarrow \delta\chi + \delta\psi + \delta\omega$$

$$\chi\psi \Rightarrow \chi\delta\psi + \psi\delta\chi$$

$$\chi/\psi \Rightarrow (y\delta\chi - \psi\delta\chi)/\psi^2$$

In this book, he gave many examples regarding differentiation and integration for various functions. For instance, for $y = x^m$ when $m = p/q$, as well as for polynomials:

$$y = \sqrt{x^2 - a^2} \Rightarrow \delta y = x\delta x/\sqrt{x^2 - a^2}$$

$$y = ax^{\nu/\mu} \Rightarrow \delta(ax^{\nu/\mu}) = \nu/\mu\ ax^{\nu/\mu - 1}\delta x$$

It should be pointed out that, instead of *d*, he utilizes the Greek letter δ, from the Greek work διαφορικό, and, furthermore, to denote that integral calculus is the inverse of differential calculus, he uses the symbol δ_χ^{-1}.

As far as integral calculus is concerned, he gave a few examples and launched the Greek term "ὁλόκληρον", i.e., the *entire* instead of integral, and he did not utilize the well-known symbol $\int$ or the derivative of first, second … order as $\delta' x$, $\delta^2 x$.

The fourth chapter is dedicated to differential equations, the eighth to the maxima and minima, and the eleventh to the points of inflection.

7 Conclusions

For a long period, Theotokis's *Elements of Mathematics* constituted a kind of Bible of Mathematics for the Greeks. As early as 1764, it was circulating in manuscript form (E. Nikolaidis, 2011, p. 158) thanks to a considerable number of copies circulating in various schools and institutions, In 1799, a manuscript of Theotokis's geometry became the manual for the students of the renowned school of Chios. Ioannis Carandinos (1784–1834) was introduced to mathematics by the Russian officer Cesar Pellegrin by means of Theotokis' *Elements* at the first public school created under the regime of the Septinsular Republic (Phili, 2007).

After its publication, this treatise became the main textbook in the Great Patriarchal School. On March 15, 1802, the Archbishop of Elassanos, Domenique Ioannikios, sent a letter to the Zosimas brothers, emphasising that they were waiting for some sets of Theotokis' treatise (I. Oikonomou, 1964). One year later, on March 5, 1803, K. Koumas, who used Theotokis' *Elements* for his lectures at the school of Tsaritsani, asked I. Sparmiotis to send him some copies of Theotokis' treatise. In 1804, the Zosimas brothers distributed 49 sets[34] of this treatise in order to facilitate the teaching of the director, Dorotheos Proïos (c. 1765–1821).

Theotokis may be said to have been the first to present differential and integral calculus in Greek in his *Physics*[35] (in the chapter regarding the pendulum, he proved some properties on the cycloid utilizing integral and differential calculus) (G. Vlachakis, 1991) and, as we have shown, in Volume III of his *Elements of Mathematics*.

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[34]It may be said that, as a result of this request, 9 sets were delivered to the renowned school of Cydonies in Asia Minor and the rest to the Kouroutzesme school in Constantinople. I Oikonomou Larissaios, *op. cit.,* 1, letter n° 10.

[35]K. Koumas characterized this treatise as a book consecrated to applied mathematics and presupposing the knowledge of derivatives and integrals. See K. Koumas, *History of Human Acts.* Vol. 12, Vienna, 1832 p. 564.

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Boscovich and the Matter of the Mediterranean Harbours

Maria Giulia Lugaresi

Abstract

The Jesuit Ruggiero Giuseppe Boscovich (1711–1787), born in the Dalmatian city of Ragusa, was professor of Mathematics at the Roman College from 1741 to 1760. He wrote many important papers on geometry, physics, optics and astronomy. Starting in 1742, he complemented his educational activity with a great number of consultations on applied mathematics, especially hydraulics. He wrote reports on the regulation of certain rivers and streams and the reclamation of extensive marshlands. His main contributions concerned the settlement of Italian harbours placed at the mouths of rivers. The long journey (1750–52) made by Boscovich in order to measure the meridian arc between Rome and Rimini gave him the opportunity to visit some important harbours on the Tyrrhenian and Adriatic Seas. Boscovich was asked for consultations about the harbour of Viareggio by the Republic of Lucca (1756), the harbour of Rimini by the Papal State, the harbour of Savona by the Republic of Genoa (1771), and the mouth of the River Adige by the Republic of Venice (1773). Soon after the Jesuit suppression, Boscovich left Italy in 1773, and accepted a prestigious assignment in Paris as director of naval optics in the French Navy. In this role, he devoted himself to studying the achromatic telescope and its application. Boscovich left France in 1782, and returned to Italy in order to attend to the publication of his work on optics and astronomy (*Opera pertinentia ad opticam et astronomiam*, 1785). His works on hydraulics have recently been collected and published in the National Edition of Boscovich's works and correspondence.

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Keywords

Ruggiero Giuseppe Boscovich · Hydraulic consultant · Regulation of rivers · Marshlands · Fluvial harbours

1 Introduction

The Jesuit Ruggiero Giuseppe Boscovich was born in the Dalmatian city of Ragusa (now Dubrovnik in Croatia), capital of the homonymous republic, on May 18, 1711. His father Nikola was a Serbian merchant, while his mother Pavica Betere (Bettera) came from the Italian city of Bergamo. Boscovich began his studies at the Jesuit College of Ragusa. In 1725, he left his native land and moved to Rome in order to complete his studies. On September 16, 1725, Boscovich left Dubrovnik to travel across the Adriatic Sea to the Papal States. He arrived in the harbour of Ancona, and then, after a further journey of several days across the peninsula, in Rome. He was admitted as a novice to the College of Sant'Andrea delle Fratte in Rome on October 31, 1725.[1] In 1728, he moved to the Roman College, where he was a pupil of Father Orazio Borgondio (1675–1741) for mathematical and physical studies. In 1740, Boscovich succeeded his teacher in the chair of Mathematics at the Roman College, maintaining this teaching post until 1760. It was in that decade that Boscovich began to publish his first scientific papers. The list of Boscovich's writings reveals how fertile his mind was and how varied his interests. He wrote many important papers on geometry, physics, optics and astronomy.[2]

Starting in 1742, Boscovich complemented his educational activity with a great number of consultations on applied mathematics, first on behalf of the Papal State, and then on behalf of the principle Italian courts. Also in 1742, he became famous for his consulting work on the stability of St Peter's Dome in Rome, together with the French mathematicians François Jacquier (1711–1788) and Thomas Le Seur (1703–1770). The survey by the three mathematicians was published in the

[1]A well-documented biography of R. G. Boscovich can be found in Paoli (1988), Bursill-Hall (1993). For the occasion of the third centenary of the birth of Ruggiero Giuseppe Boscovich, one of the most representative and cosmopolitan Italian scientists of the 18th century, the Brera Astronomical Observatory, the National Academy of the Sciences, also called Academy of the Forty, and the Pontifical Gregorian University have promoted a project of a National Edition of the works (both printed and unpublished) and correspondence of Boscovich. The project, still in progress, can be seen at this link: http://www.brera.inaf.it/edizionenazionaleboscovich/index.php.

[2]Boscovich's first mathematical papers appeared in the *Giornale de' letterati di Roma*. These works have now been published in Pepe (2010a). On Boscovich's mathematical works, see also: Pepe (2010b); Del Centina and Fiocca (2018a, b).

same year.[3] Many papers on applied mathematics, especially hydraulics, followed this first consultation on an architectural work.

2 Boscovich's Journey in the Papal State (1750–1752) and His First Commissions Concerning Waters

Boscovich was one of the most relevant figures in the study of the motion of waters in the second half of the 18th century in Italy. His works on the science of waters—written between 1744 and 1782—occupied a significant part of his scientific production. His main contributions concerned the settlement of Italian harbours placed at the mouths of rivers. He wrote reports on faulty harbours (Fiumicino, Magnavacca, Viareggio, Rimini, Savona), on the regulation of certain rivers (Tiber, Po, Adige) and streams (Caina and Nistore, near Perugia), and the reclamation of extensive marshlands (the Pontine Marshes, south of Rome, and the Lake of Bientina in Tuscany). Many Italian courts—the Republic of Lucca, Genoa and Venice, the Duchy of Modena—had cause to be grateful for his advice.[4]

As for studies on fluvial hydraulics, Italy has led the field since the 17th century. The Galilean school greatly contributed to the development of the mechanics of flow. The concepts of steady flow continuity equation in rivers, water flow from a container and some other qualitative concepts of flow resistance in rivers came from the Italian school of hydraulics, which included Benedetto Castelli (1578–1643), Evangelista Torricelli (1608–1647) and Domenico Guglielmini (1655–1710). Castelli began to study problems related to practical hydraulics soon after his involvement in the debate regarding the regulation of the rivers between the provinces of Bologna and Ferrara. Phoronomy—the subject that studies the efflux of water through small openings made in the walls of a vessel—was studied by Torricelli by observing the behaviour of water jets. He compared the path traced by a free jet with projectile theory and related the jet velocity to the square root of the pressure generating the flow.[5]

The foundations of hydrodynamics were formulated by four 18th century mathematicians. In the *Hydrodynamica* (1738), Daniel Bernoulli (1700–1782) formulated the concept of conservation of energy in fluids. Johann Bernoulli (1667–1748) published the treatise *Hydraulica* (in *Opera omnia*, 4, 1742). In his *Traité de l'équilibre et du mouvement des fluides* (1744), Jean D'Alembert (1717–1783)

[3]Between the end of 1742 and the beginning of 1743, Boscovich, Jacquier and Le Seur published two reports: R. G. Boscovich, F. Jacquier, T. Le Seur: *Parere di tre Matematici sopra i danni che si sono trovati nella Cupola di S. Pietro*; Idd.: *Riflessioni sopra alcune difficoltà spettanti i danni, e risarcimenti della Cupola di S. Pietro*. These works are now included in Capecchi (2010, pp. 87–168).

[4]The works on hydraulics have been published in the National Edition of Boscovich's works and correspondence. See Lugaresi (2013).

[5]Phoronomy had been wrongly applied by Guglielmini to the motion of water and, despite the error, this law survived for many years. It had been quoted both in the *Cyclopaedia* by Chambers (1738) and in the *Encyclopédie* by D'Alembert in the article *Fleuve* (1756).

developed Bernoulli's theory about fluid mechanics in order to search for "general formulas", after which, in his *Essai d'une nouvelle théorie de la résistance des fluides* (1752), he took a more practical approach, based on hydraulic experiments. But the most significant contribution to fluid mechanics came from Leonhard Euler (1707–1783), who detailed the general equations of hydrodynamics for incompressible fluids in three essays published in 1757 in the «Mémoires de l'académie des sciences de Berlin»: *Principes géréraux de l'état d'équilibre d'un fluide*; *Principes généraux du mouvement des fluides*; *Continuation des recherches sur la théorie du mouvement des fluides*. Bernoulli, D'Alembert and Euler tried to extend these theoretical results to fluvial hydraulics. Euler also wrote a specific paper on this subject, *Recherches sur le mouvement des rivières* (1767). The motion of water, however, could not be described by Euler's equations, because they referred to ideal conditions and did not consider the whirling motions and frictional forces of the water in the river bed.

Like many other contemporary experts, Boscovich thought that the science of waters was mostly theory, as no reliable laws existed. Writing to his pupil, Francesco Puccinelli (1741–1809), Boscovich suggested that he should "completely devote himself to the studies on waters and to the engineer's craft". He also said that "as far as waters were concerned little could be said for certain and that it was more a question of common sense and judgement". As regards the books that Puccinelli needed to study, Boscovich suggested the *Architecture Hydraulique* by Bernard Bélidor (1698–1761), "that is a classic and can be very useful, even if there are some mistakes", the works *Hydrodynamique* or *Hydrostatique* by Charles Bossut (1730–1814), "that have been very highly acclaimed". Additionally, the *Idrostatica* by Giovanni Antonio Lecchi (1702–1776) would give him "good insight".[6] Boscovich was well-informed about the most recently published Italian treatises. Talking about the waters with the Venetian mathematician and hydraulician Anton Maria Lorgna (1735–1796), Boscovich recommended to him the treatise by Lecchi (*Idrostatica esaminata ne' suoi principj e stabilita nelle sue regole della misura dell'acque correnti*), in which the author explained "principles and rules for the measure of waters, both those coming out of vessels and those running in the rivers", and the treatise by Francesco Domenico Michelotti (*Sperimenti idraulici principalmente diretti a confermare la teorica, e facilitare la pratica del misurare le acque correnti*), a work "full of experiments", even if they were "weak" from a theoretical point of view.[7]

[6][…] *farà bene a darsi totalmente a quello, che riguarda le acque, e il mestiere degli ingegneri.* […] *In ordine agli elementi i communi ella li sa a maraviglia: per quello risguarda le acque, poco vi ha di sicuro, e vi vuole piuttosto un buon senso, e giudizio* […] *Può ajutarla molto l'Architettura Idraulica di Belidor, che è opera classica, benché vi sieno degli sbagli, e può farsi venire di qua, se non ve ne sono costi degli esemplari, l'Idrodinamica, o Idrostatica di Bossut, che viene celebrata assai. L'opera di Lecchi le darà pure de' buoni lumi.* Boscovich to Puccinelli. Paris, January 8, 1774. Tolomeo (2009, p. 100).

[7]*La materia delle acque è ben intrigata, e molto poco diggerita. Su questo argomento ha scritto assai bene nella sua opera di 3 anni sono il P. Lecchi, in cui esamina la teoria tanto dell'acqua che esce da' fori, quanto di quella, che corre per gli alvei: non so se sia arrivata costà: è intitolata Idrostatica esaminata. In Turino uscì l'anno scorso un'opera del Michelotti piena di esperimenti,*

In 1750, under the pontificate of Benedict XIV, Boscovich was commissioned by the Secretary of State, Silvio Valenti Gonzaga (1690–1756), to undertake a journey to measure the meridian arc between Rome and Rimini and to draw a map of the Papal State, together with Father Christopher Maire (1697–1767), cartographer and astronomer. The journey took place between October 1750 and November 1752. The two mathematicians travelled along the lands of the Papal States, crossing different towns and swaths of countryside in order to carry out geodetic triangulations. The report of this long journey was published in Rome in 1755: *De litteraria expeditione per pontificiam ditionem ad dimetiendos duos meridiani gradus et corrigendam mappam geographicam, jussu, et auspiciis Benedicti XIV. Pont. Max. suscepta a Patribus Societatis Jesu Christophoro Maire et Rogerio Josepho Boscovich*, together with the map of the Papal State.[8]

During this adventurous journey, Boscovich visited some important harbours on the Adriatic Sea (Rimini, Pesaro, Fano, Senigallia) that were located near the mouth of torrential streams. These rivers carried with them a great quantity of stones, sand and gravel. Near the mouths, the slopes decreased, thus slowing down the flow of the rivers. Stones and gravel settling on the bottom were obstructing entry to the harbours, so the technicians had tried to solve the problem by means of the construction of the so-called "moli guardiani".[9] It was impossible to completely remove the causes of the evils, so, each time, Boscovich did his best to remedy their bad effects.

e avrebbe il maggior commodo del mondo per farne di eccellenti, e liquidar varj punti; ma è troppo debole nelle teorie. Boscovich to Lorgna, Pavia, June 7, 1768. Nastasi (2009, p. 46). In the *Idrostatica esaminata ne' suoi principj e stabilita nelle sue regole della misura dell'acque correnti,* (1765), Lecchi tried to apply geometric theories to the experimental observations. He had recourse to practical experience in his effort to fix the laws that describe the motion of water. Lecchi showed how to get the speed and the quantity of water flowing out of vessels of different shapes through holes at different heights. See Lugaresi (2017a, pp. 249–252). The hydraulic experiments conducted inside Parella's laboratory gave Michelotti useful material for writing his important treatise, in two volumes, *Sperimenti idraulici principalmente diretti a confermare la teorica, e facilitare la pratica del misurare le acque correnti* (1767–71, two volumes). Parella's laboratory was structured for hydraulic experiments, created in order to study the motion of water. It can be considered one of the most representative examples of the union between educational and research structure. The building was located not far from Turin. It consisted of an empty square cross-section tower where water entered at the top and flowed out at the bottom through, as with Lecchi's experiments, holes of different shapes cut at different heights. Michelotti similarly tried to apply geometric theories to the experimental observations, also in order to establish the laws that describe the movement of waters, so as to be able to measure the speed and quantity of water flowing out from vessels. See Lugaresi (2017b, pp. 13–16).

[8]In 1770, the work was translated into French and published in Paris: *Voyage astronomique et géographique, dans l'état de l'Eglise*. The Italian translation of the first two chapters of the volume was published in Franchini (2011).

[9]The "moli guardiani" are docks built as a form of defence for fluvial harbours in order to counteract the silt effect of sea currents. These kinds of device were adopted in many harbours on the Adriatic coast, such as Pesaro, Fano, and Rimini, in order to prevent sand and debris from arriving at the mouth of the harbour.

> It cannot be denied that all harbours placed at the river mouth have by their very nature many defects.[10]

Boscovich's words about this kind of harbour are well representative of the difficult situations that he had to tackle.

During the long journey around the Papal States, Boscovich was commissioned for his first works on practical hydraulics in order to improve access to the harbours of Fiumicino, on the Tyrrhenian Sea, and Magnavacca, on the Adriatic Sea.

In November 1750, because of frequent storms, the Tiber overflowed twice, inundating Rome. As regards length and flow rate, the Tiber was No. 3 on the list of Italian rivers, after the Po and the Adige. Along its path, it crossed Tuscany, Umbria, and Lazio, and passed through the city of Rome. When it reached Capo Due Rami, its path divided into two delta branches: the Fiumara Grande and the canal of Fiumicino. The Tiber was so fast-flowing and winding that it accumulated a great quantity of stones near its mouth, which, given the opposition of the sea at this point, obstructed the navigation of ships. To prevent the silting up of the harbour, the proposed remedy was the construction of "passonate", which consisted of wooden stakes placed in the ground to regulate the path of the river.

At the end of January 1751, Pope Benedict XIV sent Boscovich and Maire to Fiumicino in order to examine the mouth of the Tiber, not only to take note of the damage to the canal, but also to give their opinion on possible measures to prevent or limit the flood damage. The two Jesuits were held up in Fiumicino for about ten days. When the Tiber re-entered its riverbed, they came back to Rome. Boscovich's detailed account was reported in a paper entitled *Scrittura su le cagioni, e rimedj de danni seguiti nelle passonate di Fiumicino per l'escrescenze degl'anni 1750, e 1751.*[11]

In the second half of the 18th century, a similar problem was to be found at the harbour of Magnavacca, which had become narrow and lacked water. The Comacchio valleys represented access to the sea, first for the Estense duchy and then for the Papal States.[12] After the devolution of Ferrara to the papacy in 1598, the harbours near the delta branches of the River Po occupied a secondary role in the interests of the new state. These harbours were not equipped for the anchorage of ships, but they represented good places for the docking of boats suitable for valley and coastal navigation. The progressive silting up of these harbours contributed to their decline. During the spring of 1752, Boscovich and Maire visited the lands of the provinces of Romagna (Rimini and Ravenna), Bologna and Ferrara in order to complete the map of the Papal States. At the beginning of June, they were

[10]*Non può negarsi, che tutti i porti costituiti nelle imboccature de' fiumi, abbiano di sua natura de' gran difetti*. See Lugaresi (2013, p. 249).

[11]In 2002, E. Mariani published the photographic reproduction of Boscovich's manuscript about the harbour of Fiumicino. The first integral transcription of the manuscript can be found in Lugaresi (2013, pp. 49–77).

[12]Nowadays, although land reclamation has reduced their size, the marshes are still one of the largest lagoon systems in Italy. They cover an area of more than 11,000 ha between Comacchio and the River Reno and are connected to the sea via canals. In some places, the stretches of brackish water are interrupted by rises in the land or divided by embankments and ancient sandbars, while in others, they extend freely.

in Comacchio. Boscovich was asked to visit the harbour of Magnavacca. He took many soundings in different parts of the canal and compared them with the past ones. Because of its position, located between two mouths of the River Po, namely, the Primaro and the Volano, a gradual withdrawal of sea waters corresponded with a progressive increase in the shore, due to continuous deposits of fluvial material. The harbour of Magnavacca was another site at which the remedy adopted was the construction of "moli guardiani", whose maintenance had to be constantly guaranteed.[13]

As his reputation grew, a greater number of Italian courts approached Boscovich for consultations on problems relating to the science of waters. In 1756, Boscovich went to Lucca in his capacity as an expert hydrographer. It was his first mission outside the Papal States. He was appointed technical consultant on behalf of the Republic of Lucca in order to try to solve a dispute against the neighbouring state of the Grand Duchy of Tuscany concerning the periodic flood of the River Serchio. Boscovich went to Lucca in order to carry out a survey on the local area. In the end, the dispute between the Republic of Lucca and Austrian Tuscany could not be settled without reference to Vienna. In 1737, the Grand Duchy of Tuscany passed to the Austrian crown, giving rule of the area to the Hapsburg-Lorraine. It was, therefore, for the Emperor to decide the Luccan-Tuscan dispute. Boscovich was chosen by the city of Lucca as their expert and intermediary and, with the permission of his superiors, he was sent to Vienna in the spring of 1757 in order to negotiate a solution. The Tuscan interest was to be represented by the Jesuit Leonardo Ximenes (1716–1786). Boscovich arrived in Vienna on April 6, 1757. In the Austrian capital, his reputation as a scholar, an adviser to the Papal States on technical matters, and an expert on diplomatic missions was well known. During his stay in Vienna, Boscovich received a reward for his expert advice. The Empress Maria Teresa, knowing he had been consulted on the stability of the dome of St Peter's, asked Boscovich to report on the structure of the Imperial Library, completed only in 1722 and already showing defects.[14] As regards the matter of the waters, in August 1757, the Emperor received Boscovich twice, and many outstanding questions of dispute were decided satisfactorily. This was a very important event in Boscovich's life and represented an international acknowledgement of his diplomatic and scientific qualities.[15]

3 Boscovich's Travels Around Europe (1759–1762)

Boscovich was back in Rome by May 1758. During his absence from Rome, his mathematical chair at the Roman College had been temporarily appointed to Bartolomeo Boscovich (1699–1770), Ruggiero's brother. Boscovich's name figured in the Collegium Romanum records for the chair in Mathematics up to 1760, even

[13]Boscovich's manuscript about the harbour of Magnavacca was published in Lugaresi (2013, pp. 96–99).
[14]Boscovich submitted a detailed report, published in 1763. See Capecchi (2010, pp. 169–208).
[15]See Lugaresi (2013, pp. 101–160).

though, in 1759, he decided to go on a long journey to Italy, France, the Netherlands and Germany.

Boscovich set off for Paris in autumn of 1759. During the long journey, he stopped in Rimini, Bologna, Modena, Reggio and Parma. Travelling through Piacenza and Lodi to Milan, he reached Turin, where he was received by King Charles Emmanuel of Sardinia. In the Savoy capital, Boscovich met his old friend Giambattista Beccaria (1716–1781), whom he had met fifteen years earlier in Rome. At that time, Beccaria was professor of experimental physics at Turin, but he was also involved in many projects in the name of the King.[16] During his stay in Turin, Boscovich convinced the King of Sardinia of the prestige derived from the measurement of an arc of meridian, and, as a result, Beccaria was given the task.[17]

Once he left Turin, Boscovich moved on to Genoa, and then to Marseilles, where he met the Jesuit Father Esprit Pézenas (1692–1776), a professor of hydrography. Pézenas had arrived in Marseilles in 1728, in order to replace Antoine Laval (1664–1728) in the chair of hydrography for the cadres and the officials of the galleys of Marseilles. Pézenas prepared a specific treatise for his teaching, *La pratique du pilotage* (1741), which was well known and appreciated by Boscovich. Pézenas was also the main promoter of the strengthening of the astronomical observatory, which was improved thanks to the financial support of the Minister of the Navy, becoming one of the best equipped scientific structures in Europe.[18] Pézenas and Boscovich shared the same interest in hydrography, navigation and, some years later, as we will see, the problem of determining longitude on the sea. Pézenas published a treatise on this topic: *Astronomie des marins ou nouveaux elemens d'astronomie a la portée des marins* (1765–1766, revised in 1771–1773).

[16]Beccaria occupied the chair of physics in Turin for more than thirty years. His experimental activity is one of Beccaria's peculiarities and characterised his entire scientific life. During the 1750s, Beccaria focused his studies on electrical phenomena. In 1753, he published an important contribution to the study of electricity, *Elettricismo artificiale e naturale libri due*. Besides his teaching activity, Beccaria took part in different projects based on his knowledge of mechanics, astronomy and hydraulics: the revision of the system of weights and measures of the kingdom of Sardinia, the placement of lightning rods, the measure of the arc meridian in Turin and the evaluation of a unit for the distribution of the water of the River Po. Beccaria had met Boscovich during his stay in Rome in 1744, after which they regularly corresponded. Their correspondence covered the period from 1755 to 1770. Among the subjects discussed by the two correspondents were the studies for a unit of measurement for waters and the measure of the meridian arc in Piedmont. These themes were very well known to Boscovich, who was a valuable advisor for Beccaria. See Lugaresi (2017b, pp. 9–13).

[17]In the work, Beccaria was helped by his university assistant, Domenico Canonica. Beccaria and Canonica worked together for fourteen years, and the results of Beccaria's studies were published in the *Gradus taurinensis* (1774).

[18]Pézenas was director of the astronomical observatory in Marseilles from 1749 to 1763. Among his collaborators, there were the Jesuits, Louis Lagrange (1711–1783) and Jean-Baptiste Blanchard (1720–1788). Pézenas was also a corresponding member of the *Académie royale des sciences* of Paris. On the figure of Pézenas and his relationship with Boscovich, see Boistel (2001).

By mid-November 1759, Boscovich was in Paris, where he remained until May 1760. During his first stay in Paris, he met such famous scientists as Alexis Claude Clairaut (1713–1765) and Joseph Jerome Lalande (1732–1807), with whom he became acquainted.[19]

Since 1760, Clairaut had focused his research activity on the construction of achromatic lenses, about which he published many treatises. Boscovich also worked on theory and calculations for the design of objective lenses, and his theory was later explained in the work *Opera pertinentia ad opticam et astronomiam* (1785). Boscovich was in correspondence with Clairaut, especially in the period 1760–1764. An extract of one of Boscovich's letters to Clairaut was published in the «Journal des Savants» in June 1761. It dealt with the study of the flux and reflux of the sea.[20]

The French astronomer Joseph Jerome Lalande was a friend and great admirer of Boscovich. Some years later, Lalande made a journey to Italy that lasted from August 1765 to August 1766. He visited many important Italian cities, such as Genoa, Turin, Milan, Rome, Naples, Florence and Venice. Boscovich accompanied him until November. When he went back to France, Lalande published a wide report, in eight volumes, of his long journey: *Voyage d'un Français en Italie fait dans les années 1765 et 1766* (Paris 1769). In his book, he said that Boscovich was the greatest mathematician that he had met in Rome and that there was no better geometer and expert of such international reputation:

> cet illustre Mathématicien, né à Raguse, après avoir long-temps professé au College Romain, est actuellement Professeur de Mathématiques à Pavie, & j'ai vu avec peine des talens superiéurs comme les siens, concentrés dans cette petite Ville; non seulement il n'y a persone en Italie donte les ouvrages soient aussi célebres dans toute l'Europe que les siens, mais je n'y connois pas de Géometre aussi profond que lui. Sa mesure de la terre, son beau traité sur la loi de la pesanteur, ses découvertes sur la lumiere & sur diverses parties de la Physique, de l'Astronomie, de la Géometrie; son poeme sur les éclipses imprimé à Londres, peuvent donner une idée de la varieté & de la profondeur de ses talens; mais il faut l'avoir connu & avoir voyagé avec lui, pour savoir combien il a de génie, combien son caractere est aimable, sa conversation intéressante, & ses idées sublimes dans tous les genres.[21]

In mid-May 1760, Boscovich left Paris and travelled to London, where he remained until December 16, 1760. There, he visited the best opticians of the day and learned of their latest achievements. Boscovich was proposed as a foreign Fellow of the Royal Society. He was elected on January 15, 1761. For four months, he travelled in Belgium, Holland, Lorraine and Germany. In July 1761, Boscovich set off from Venice, together with the Venetian Ambassador Pietro Correr (1707–1768), reaching Constantinople in October 1761, and remaining there until May

[19]Alexis Claude Clairaut made important theoretical and practical contributions to geodesy, the discipline related to the study of the Earth's shape. In 1736, he was involved in a journey to Lapland with Pierre Louis Moreau de Maupertuis (1698–1759). Their results confirmed the Newtonian theory of the crushing of the earth's globe. The journey through the Papal States made by Boscovich and Maire in 1750–52 was part of this larger project.

[20]Lugaresi (2013, pp. 177–184).

[21]Lalande (1769), vol. 8, pp. 447–448.

1762. Boscovich's return journey took him through Poland and Vienna, where he remained until March 1763. In November 1763, he was back in Rome. During this long season of travels around Europe (about five years), Boscovich's hydraulic consultations were temporarily suspended.

4 The Year 1764: From Rome to Pavia

In the spring of 1763, Boscovich had received an invitation to occupy the chair of Mathematics at the University of Pavia. He accepted the proposal and, at the end of 1763, he was appointed teacher of mathematics at the University of Pavia.

Before leaving for Lombardy, Boscovich had to tackle the centuries-old problem of the drainage of the Pontine marshes. This area, lying between the Lepini and Ausoni mountains and the coast from Mount Circes to the south of Anzio, covered some 80,000 hectares, 30,000 of which consisted of Quaternary spits and dunes along the coast, while the other 50,000 were pestilential marsh. In the 18th century, a more vigorous attempt was made to deal with this grave problem and work was actually begun. Boscovich's survey in the Pontine Marshes took place from January to March 1764. Boscovich studied, along with Cardinal Simone Bonaccorsi (1708–1776), the problem of the Pontine marshes, mainly in Terracina. During the 18th century, many projects for their reclamation were promoted by the Popes. In 1726, Benedict XIII asked the technician Romualdo Bertaglia (1688–1763), from Ferrara, to visit the Pontine marshes and to give his opinion as to their reclamation. After a long visit, Bertaglia provided some advice in a paper that was published in 1729. Unfortunately, the Pope died before anything could be enacted. During the pontificate of Clement XII, the Bolognese hydraulic technician Eustachio Manfredi (1674–1739) was asked for a consultation. His opinion aligned with that of Bertaglia's from 1729, but, once again, nothing happened and the project was abandoned for about thirty years. In 1759, Emerico Bolognini (1713–1777) published a wide historical report about the Pontine marshes: *Memorie dell'antico, e moderno stato delle Paludi Pontine*. The new Pope, Clement XIII, decided to submit the same project for new examination. In 1760, he asked Romualdo Bertaglia and Gabriele Manfredi (1681–1761), who had succeeded his dead brother, Eustachio, to conduct some surveys and measurements. One year later, Manfredi and Bertaglia produced their report: *Relazione delle Paduli Pontine de' Sigg. Gabriele Manfredi e Romualdo Bertaglia*.[22] This paper was submitted by Bonaccorsi for Boscovich's judgement. Boscovich, after reading Manfredi and Bertaglia's work, visited the sites many times, conducting surveys and measurements. Boscovich drew up his report and, before leaving for Pavia in spring of 1764, he submitted a printed copy of his *Esame del progetto del Manfredi e Bertaglia in riguardo alle Paludi Pontine e porto di Terracina* to Pope Clement XIII.[23]

[22] This work has been included in Ximenes (1785), vol. 1, pp. 7–74.

[23] The first edition of this paper was included in Ximenes (1785), pp. 75–116; it can also now be found in Lugaresi (2013, pp. 192–215).

As regards hydraulic surveys, the year 1764 was very productive for Boscovich. During the spring, he was commissioned by an Italian nobleman to solve some disputes about neighbouring territories along the riverbanks of the Po near the city of Piacenza.[24] In October 1764, Boscovich received one of the most important hydraulic commissions of his career. He was asked by the city of Rimini to try to solve the problem of the silting up of the harbour. The harbour stood on a delta branch of the Marecchia, a torrential river that crossed the city of Rimini and was in bad condition. Whenever the river flooded, the forecast reliefs proved insufficient. A great quantity of stones and gravel had settled near the mouth, so it was difficult for boats to enter the harbour. Boscovich spent almost a month in Rimini in order to take measurements and study the problem. According to Boscovich, the only way to make the harbour safe and efficient was to divert the river away from it.[25]

As previously mentioned, in 1764, Boscovich became professor at the University of Pavia. His transfer to this university did not result in a return to his mathematical studies, because of the lack of suitable scientific facilities. Boscovich preferred to settle in Milan, where he was also involved in the foundation of the astronomical observatory at Brera. In Milan, he promoted the mathematical studies of his pupil Francesco Luino and the hydrodynamic theoretical research works of the Jesuit Giovanni Antonio Lecchi.[26]

Lecchi's hydrodynamic investigations reached their peak with the publication of the *Idrostatica esaminata ne' suoi principi, e stabilita nelle sue regole della misura dell'acque correnti*. In this book, published in Milan in 1765, Lecchi intended to provide a good theoretical grounding in the science of waters. Lecchi looked upon Boscovich as a good hydraulic teacher. Boscovich was well informed concerning the state of hydrodynamic research. He had read the works by Daniel Bernoulli (*Hydrodynamica*, 1738) and D'Alembert (*Traité de l'équilibre et du mouvement des fluids*, 1744), two of the most important works on hydraulics and hydrodynamics. Lecchi complained that hydrometrics and hydraulics were lacking in practical experience. Even though Lecchi recognized the soundness of the experiments conducted up until that time, no universal hydrostatic law had yet been established.[27]

[24]Lugaresi (2013, pp. 217–232).

[25]Boscovich's solution was successful, but it was not until the first half of the 20th century that a project for diverting the River Marecchia was carried out. Boscovich collected all his observations in a manuscript that was published in 1765 in Pesaro: *Del porto di Rimini*; it can also now be found in Lugaresi (2013, pp. 242–290).

[26]Giovanni Antonio Lecchi was a professor at Brera College, where he taught mathematics (1738–1760), then mathematics and hydraulics (1760–1773). But even while he taught at Brera, he mainly worked as a hydraulic engineer. From 1757, he was interested in technical issues connected to the problems of hydraulic engineering on behalf of the Hapsburg government. In 1759, the Austrian Empress, Maria Theresa conferred upon him the title of royal mathematician and hydraulic engineer ("matematico e idraulico regio"). On the figure of Lecchi and his relationship with Boscovich, see Lugaresi (2017a).

[27]Lecchi hoped that Boscovich could improve the practical aspect of the science of waters with a set of experiments, inspired by the *Phoronomia* (1716) by Jacob Hermann and the *Architecture Hydraulique* (1737) by Bernard Bélidor. See Lugaresi (2017, p. 254).

On Lecchi's request, Boscovich revised the *Idrostatica* and contributed to Lecchi's work, writing a specific theoretical paper in the form of letter that was inserted into the third part of the work.[28]

5 Boscovich's Return to Practical Hydraulics

After leaving theoretical studies, Boscovich returned to practical hydraulics as an expert. In 1766, at the request of the Reverenda Camera Apostolica, he went to Umbria to examine the problems related to the irregular flow of certain tributaries of the Tiber.[29]

At the beginning of October 1771, Marcello Durazzo and Francesco Maria Doria—delegates of the Republic of Genoa for the works in the harbour of Savona—asked Boscovich for his advice about "the reopening of the harbour of the city of Savona, already obstructed by a great quantity of sand".[30] Boscovich was expected to be in Genoa some weeks later, as confirmed by another letter from Durazzo. In November 1771, Boscovich was in Savona to find a solution to the problem of the silting up of the harbour. The damage to the harbour of Savona involved the narrowing of the mouth, due to the accumulation of beach sediments, and the gradual reduction of the seabed in the mouth and in the dock. The result of his survey was the paper entitled *Sui danni del porto di Savona*.[31]

In June 1773, on behalf of the Republic of Venice, Boscovich wrote a very interesting report about the mouth of the River Adige. In this paper, Boscovich gave a wide overview of his hydraulic knowledge, acquired over the previous twenty years. He examined the general stream of both the Adriatic and Mediterranean Seas, explaining the phenomenon of the accumulation of beach sediment, which was highly typical of all the places and harbours that he had visited. He quoted the observations he made in the cities of Fano and Rimini (on the Adriatic Sea), in the gulf between Livorno and La Spezia, and in Savona (on the Tyrrhenian Sea).[32]

Soon after the canonical suppression of the Society of Jesus (July 21, 1773), Boscovich decided to leave Italy and move to France. Thanks to his friendship with the Duke of Aiguillon, then Minister of Foreign Affairs, and Pierre Étienne

[28] *Lettera del P. Boscovich sulli principi, su' quali si possano appoggiare le Regole pratiche per la misura dell'acque, ch'escono dalle aperture, e corrono per gli alvei*, now in Lugaresi (2013, pp. 295–312).

[29] Lugaresi (2013, pp. 313–346).

[30] *Trattasi del riaprimento del porto della città di Savona oramai ingombro da una grandiosa quantità di arene*. Letter by Marcello Durazzo to Boscovich, Genoa, October 5, 1771. See Proverbio (2014, p. 134). Marcello Durazzo (1710–1791) belonged to one of the most important Genoese families and was a friend of Boscovich's. Durazzo was Doge of Genoa for two years. In 1771, Durazzo and Francesco Maria Doria were chosen as delegates of the Republic of Genoa for the works in the harbour of Savona.

[31] The manuscript has been transcribed in Lugaresi (2013, pp. 365–392).

[32] The paper entitled *Sullo sbocco dell'Adige in mare* has been published in Lugaresi (2013, pp. 397–410).

Bourgeois de Boynes, the Minister of Maritime Affairs, Boscovich obtained the creation of a special post from the King. He was made Director of Naval Optics of the French Navy. As regards his duties, Boscovich said that he had to devote himself to perfecting the achromatic telescope that the French Navy needed, and he had to concentrate on research to satisfy his zeal for the progress of science and to devote himself to his sublime meditations:

> Les intentions du Roi Louis XV en me fixant dans ses états, se trouvent clairement exprimées dans les deux Brevets que Sa Majesté me fit expédier, l'un aux Affaires étrangères, & l'autre à la Marine. Après l'éloge le plus flatteur de mes Ouvrages, le premier ajoute expressément qu'ils ont engagé Sa Majesté à me fixer en France par ses bienfaits, de manière que je puisse me livrer sans distraction à l'attrait des Méditations sublimes, & à mon zele pour l'accroissement des Sciences. Le second me donne le titre de Directeur d'Optique au service de la Marine, pour perfectionner l'Optique & particulièrement la théorie des Lunettes Acromatiques, dont la Marine a besoin pour les Observatoires astronomiques, & pour le service des Vaisseaux.[33]

In October 1773, Boscovich arrived in Paris, where he remained until July 1782. During his stay in France, Boscovich was able to take an interest in some ongoing works on French navigable canals. In a letter to his Tuscan friend, Giovanni Attilio Arnolfini (1733–1791), he explained:

> You asked me if there was anything published about the planned canal in Provence. Mr Lalande assures me there is a printed memoir on this subject, but it is not here. As regards the canal of Burgundy, they are working at both ends, i.e. in the St. Florintin side and in the St. Jean de Losne side. […] The canal of Murcia has been completely abandoned. […] As for the canal of Picardy, M.me de la Condamine, widow of the famous Academician, sent her brother, who had a house near the same canal, a note, in which I had discussed many of the points she had proposed.[34]

6 Boscovich's Research in Paris

In January 1774, soon after being employed at the Ministry of the Navy, Boscovich was asked to examine a short paper about the problem of determining longitude on the sea, entitled *Mémoire sur l'impossibilité actuelle d'appliquer les mouvemens de la Lune à la recherché des longitudines marines*, a paper that Esprit Pézenas had sent to the Minister of the French Navy.[35]

[33] Guzzardi (2012, p. 532).

[34] *Ella dimandava se vi è nulla di stampato sul canale proggettato per la Provenza. Il Sig: de la Lande mi assicura che vi è stata una Memoria stampata su quell'oggetto; ma non si trova qui, se non per accidente*. […] *Pel canale di Borgogna si lavora abitualmente da ambe le due estremità, cioè dalla parte di S.t Florintin, e di S. Jean de Losne*. […] *Il canale di Murcia è stato abbandonato totalmente*. […] *In ordine al canal di Piccardia, la Sig:ra de la Condamine vedova del celebre Accademico mandò a suo fratello, che ha una villa contigua al canale medesimo, un foglio, in cui io avevo messo in tante interrogazioni tutti i punti proposti da lei*. Letter by Boscovich to G. A. Arnolfini, December 31, 1781. See Arrighi (1963, pp. 72–73).

[35] Boistel (2001, pp. 387–391).

The French years were full of constructive scientific works. During his stay in Paris, Boscovich was completing his works on optics and astronomy that he hoped to have published in France in the Royal typography. King Louis XVI agreed to be the subject of the dedication, but he would not allow the printing in the Royal typography. As a result, Boscovich had to ask the Italian typographer Remondini to publish his collected works on optics and astronomy. Thus, in 1782, Boscovich applied to the King for a two-year leave of absence to go to Italy. In July 1782, he left Paris and returned to Italy. At the end of April 1783, Boscovich was in Bassano. He stayed with Remondini, who had an important typography.[36] There, he could supervise the printing of five volumes of his work, entitled *Opera pertinentia ad opticam et astronomiam*. It was a difficult task, because of the complexity and breadth of the work, so, during the revision stage, Boscovich was supported by some collaborators. His pupil Francesco Puccinelli and the young nobleman Leonardo Stecchini from Bassano were involved in revising drafts and calculations.[37]

Since many of these writings had been written in France, the five volumes of the *Opera pertinentia ad opticam et astronomiam*, as indicated above, were dedicated to King Louis XVI. In reference to his French scientific production, in the *Precis des ouvrages mentionnés et compris dans l'epitre dédicatoire*, put at the end of the work *Les eclipses* (Paris, 1779), Boscovich wrote:

> J'ai fait à mon arrive en France un ouvrage sur l'objet énoncé dans mon Brevet de la Marine, qui regarde les Lunettes Acromatiques; mais j'y ajouterai un extrait, avec toutes les regles pratiques en françois. […].
>
> J'ai préparé un grand nombre d'opuscules, dont une grande partie a été faite en entier après mon arrivée en France. Un volume est destiné pour ceux qui contiennent des méthodes nouvelles de vérifier tous les différens instrumens qu'on emploie à présent dans l'Astronomie. […] Il y aura encore des opuscules pour une construction particulière d'une pendule Astronomique, & d'un Micromètre objectif, différent de celui de M. l'Abbé Rochon […]. Du même genre est le plan d'un Observatoire propre pour le grand cercle horizontal […]. Ce recueil de Mémoires doit être très-utile à l'Astronomie pratique. […] D'autres opuscules ont différens objets: il y en a un sur la théorie des réfractions astronomiques. […] Un autre opuscule a pour objet la manière de déterminer avec la précision de quelques millièmes de ligne, la longueur du pendule simple isochrone aux secondes horaires, avec la description de l'instrument, & une méthode pour déterminer la partie d'une oscillation gagnée ou perdue, quand on pousse le poids pour ranimer le mouvement & le faire continuer pendant vingt-quatre heures. Cet ouvrage a été fait à l'occasion d'un ordre que M. Messier avoit reçu du Ministre de la Marine, pour faire cette observation avec la plus grande exactitude possible, à la latitude de 45 degrés. […] Une autre Mémoire contient la manière de trouver par deux erreurs d'une ligne méridienne déterminées dans deux de ses

[36]Since 1773, Giuseppe and Antonio Remondini had supervised the typography of the same name, located in the Venetian city of Bassano. Giuseppe Remondini (1745–1811) was an experienced businessman. Under his management, the typography of Bassano reached the peak of its fortune. His younger brother, Antonio Remondini, dealt with chalcography. See Tolomeo (2009, pp. 320–323).

[37]Leonardo Stecchini (1761–1826) cultivated scientific studies in Padua with the mathematician Giambattista Nicolai and the botanist Giovanni Marsili. Boscovich really appreciated Stecchini's scientific qualities and asked him to revise drafts for him. On the figure of Leonardo Stecchini, see Tolomeo (2009).

> points, les erreurs de tout autre point, avec l'application de la même méthode pour la vérification de l'instrument des passages. […] Enfin j'ai un abrégé des éléments de l'Astronomie, pour un Marin. Je l'ai fait exprès pour Son Altesse Sérénissime Monseigneur le Duc de Chartres, à qui j'ai eu l'honneur de l'expliquer, avant son embarquement sur l'Escadre.[38]

Among the papers Boscovich prepared while he was in France, there was a brief compendium of astronomy for mariners (*Notice abrégée de l'astronomie pour un Marin*). That was how Boscovich described it in 1779, while he was announcing the publication of his collection of works on optics and astronomy. Six years later, the work was published. Thanks to Boscovich's announcement, we understand that the Duke of Chartres, Louis-Philippe I (1725–1785), King Louis XV's nephew, had chosen Boscovich as the tutor for astronomy applied to maritime affairs:

> J'ai fait cet Opuscule à l'occasion que Son Altesse Sérénissime Monseigneur le Duc de Chartres avant son départ de Paris pour commander une division de l'armée navale m'a fait l'honneur de m'employer pour lui rappeller les premières idées de la sphère, & lui donner une notice abrégée de l'Astronomie principalement pour ce qu'elle a de rapport avec la Marine. Le temps pressoit, & il falloit faire un court extrait en donnant seulement des idées générales des objets les plus intéressants. […] Son Altesse Sérénissime m'a étonné par son zèle, son assiduité, son application, & son talent supérieur. Il avoit la bonté de s'entretenir avec moi quatre, & encore cinq fois par semaine plusieurs heures avec toute l'attention possible […]. Il a bien voulu manier les instruments lui-même en ma présence, & il a mesuré des angles avec le rapporteur, avec le quart de cercle mobile, & particuliérement avec un octant de réflexion, qui est d'un usage si précieux pour la Marine.[39]

Boscovich hoped that his short paper could be useful for those who wanted to acquire a general idea of astronomical objects and instruments and their use at the astronomical observatory. Boscovich's *Opuscule* was divided into five parts: (I) The celestial bodies and their apparent motions; (II) The armillary sphere and the Earth; (III) The real motion of the celestial bodies and their physical causes; (IV) The relation between astronomy and marine; (V) The instruments.

Boscovich mainly focused on the most relevant topics that could be useful for mariners travelling on the sea. Some instruments of support were the annual periodical *Connoissance des temps* and the nautical almanac.[40] As regards the relationship between astronomy and maritime affairs, Boscovich pointed out three factors: the direction of the ship's course, and the geographic latitude and longitude. He explained the difficulty of taking measurements in astronomy and attempting to determine longitude on the sea. He quoted an "excellent treatise" by Charles-Pierre Claret, Earl of Fleurieu (1738–1810): *Voyage fait par ordre du Roi en 1768 et 1769 à différentes parties du monde, pour éprouver en mer les horloges marines inventées par M. Ferdinand Berthoud* (Paris 1773, two volumes). Fleurieu and

[38]Guzzardi (2012, pp. 605–608).

[39]R. G. Boscovich, *Opera pertinentia ad Opticam et Astronomiam*, vol. 5, pp. 270–337, in particular, pp. 270–271. It can now be found in Rigutti (2010, pp. 322–323).

[40]The *Connoissance des temps* was an annual periodical that was published from 1679 to 1789. Since 1702, it had belonged to the Royal Academy of Sciences of Paris. J. J. Lalande was the director during the period 1760–1775.

Berthoud, who worked on account of French Navy, were in direct touch with Boscovich during the years he spent at the service of French Navy.[41]

Given the above, as regard hydraulics, we can note that the role played by Boscovich in France was not that of a consultant on practical instances of hydraulics, but rather on theoretical astronomical studies that had to support both civil and military navigation.

7 Boscovich's Project for the Nuovo Ozzeri (1782) and His Return to Italy

Boscovich did not entirely give up practical hydraulics. In 1781, he was enlisted by the Republic of Lucca to examine a reclamation project for Lake Bientina in Tuscany. Lake Bientina was a deep depression between the path of the River Serchio to the north and that of the Arno to the south. During the 18th century, it still represented one of the widest wet internal areas of Tuscany. The reclamation project, proposed by the Jesuit mathematician Leonardo Ximenes, consisted of the creation of a new canal, which should have passed under the River Serchio, leaving from the bottom of Lake Bientina and crossing the plain between the city of Lucca and the Ozzeri canal. This new canal would have allowed the waters to be discharged into Lake Massaciuccoli through a tunnel in the Balbano Mountain. Then, the waters were to have been taken from Lake Massaciuccoli to the Viareggio mouth through an existing canal. Three papers were written by Boscovich between 1781 and 1782 concerning Lake Bientina: *Sul progetto del canal di Lucca. Riflessioni di Boscovich sulla relazione di Ximenes*; *Scrittura dell'ab. Ruggiero Giuseppe Boscovich sulle difficoltà proposte da' Sig.ri Interessati contro il prog-*

[41]Charles Pierre Claret de Fleurieu (1738–1810) was a French hydrographer and politician. He was engaged in the Toulon company of the Garde-marine and took part in the campaigns of the Seven Years' War. He obtained the title of "Enseigne de vaisseau". In July 1765, he was made "Enseigne de port", and subsequently moved to Paris to study horology with Ferdinand Berthoud. He took part in a one-year sea campaign to test Berthoud's marine chronometer from autumn 1768 to October 1769. The testing expedition was described by Fleurieu in his treatise *Voyage fait par ordre du Roi, pour éprouver en mer les horloges marines inventées par M. Ferdinand Berthoud* (Paris, 1773). Fleurieu was made "Lieutenant de vaisseau" in October 1, 1773, and then "Deputy inspector of naval charts and plans". In December 1776, he became "Capitaine de vaisseau" and, soon afterwards, "Director of ports and arsenals" (January 1777).

Ferdinand Berthoud (1727–1807) was a Swiss horologist. In 1745, he moved to Paris to improve his skills, and from 1766, he collaborated with the Ministry of the French navy in order to develop sea clocks. In 1770, he was appointed "Horloger Mécanicien du Roi et de la Marine", and thus ended up supervising the construction of the sea clocks. In 1773, Berthoud published his *Traité des horloges marines contenant la théorie, la construction, la main-d'œuvre de ces machines et la manière de les éprouver, pour parvenir par leur moyen, à la rectification des cartes marines et à la détermination des longitudes en mer.*

getto del Nuovo Ozzeri; *Sentimento sulle cataratte in bocca di Ozzeri*. These papers represented Boscovich's final contribution to the science of waters.[42]

8 Conclusions

Boscovich was important for both his theoretical and practical studies, creating a synthesis between mathematical knowledge and specific problems in the territory. He made the best use of the mathematical knowledge at his disposal, even if he had not studied the recent discoveries by Euler on the motion of fluids. As we have already said, as regards the motion of water, a general theory that enabled even easily observable phenomena did not exist. Boscovich applied some empirical formulas, by adapting them to suit concrete situations. The greatest difficulty, using both equations and empirical formulas, was represented by the whirling motion of waters that flow in rivers and canals. Boscovich's hydraulic advices always focused on the concrete situations of the rivers and territories through which they passed. The 17th century saw the beginning of a great quantity of papers being written on the practical problems of hydraulics, many of which shared the same features. They dealt with the regulations of rivers (Reno, Po of Ferrara, Adige), the lagoon of Venice, and the reclamation of large areas of marshland (the Valdichiana, Lake Bientina, the Pontine marshes). A useful historical source for understanding the main hydraulic problems that Italian mathematicians had been discussing since the 17th century can be found in the collections regarding the motion of waters (*Raccolta d'autori che trattano del moto dell'acque*) that began to be published in Italy during the 18th century.[43]

During the 1700s, hydraulics remained an essentially practical discipline. As regards the development of the science of waters, in 1777, Joseph Louis Lagrange, writing to Anton Maria Lorgna, said that the principles of this discipline remained vague and that there was still no geometric theory on this subject:

> With the exception of infrequently used general principles, I have found too much vague reasoning and experience that cannot be used as a foundation for a strict and geometric theory. This science may be compared to practical medicine, which, despite its importance and the many things that have been discovered in anatomy, chemistry and natural history, has not progressed since the times of Hippocrates, in fact, it may even have regressed.[44]

[42]Boscovich's paper was printed for the first time in Ximenes (1782, pp. 173–205). It can now be found in Lugaresi (2013, pp. 417–474).

[43]These works collected the main contributions of Italian mathematicians to the study of the motion of water from theoretical and practical points of view. These collections, published in Italy in five editions between the eighteenth and the first half of the 19th century in Florence, Parma and Bologna, represented an *unicum* in the international scientific and technical literature on the subject. The collections concerning the motion of waters have been studied in Lugaresi (2015).

[44]*Fatta eccezione per qualche principio generale la cui applicazione ha raramente luogo, non vi ho trovato che ragionamenti ed esperienze troppo vaghi per poter servire da fondamento ad una teoria rigorosa e geometrica. Fin'ora è di questa scienza come della medicina pratica che, nonostante la sua estrema importanza e nonostante le belle scoperte che sono state fatte in Anatomia, in Chimica, in Storia Naturale ecc. non è più progredita dal tempo di IppocrateIppocrate, se anche non è regredita*. Lagrange (1892), vol. XIV, p. 260.

The study of the motion of waters did not require knowledge of the refined analytical tools (partial differential equations, calculus of variation and so on) that were developed during the 18th century. This discipline was a very congenial one for Boscovich, whose versatility and good knowledge of algebra and infinitesimal calculus allowed him to understand the core problems that needed to be solved. While not disdaining theoretical hydrodynamic issues, Boscovich preferred to devote himself to the solution of practical hydraulic problems.

Boscovich had intended to collect all of his papers on hydraulics, but he died before this project could be put into effect. Boscovich's works on hydraulics have recently been collected and published in the National Edition of Boscovich's works and correspondence.

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An Enlightened Expert on the Movement and Globalization of Civil Engineering: Augustin Betancourt (1756–1824)

Irina Gouzevitch

Abstract

In this chapter, we shall examine the transnational path undertaken by the Spanish engineer Augustin Betancourt, an emblematic figure of the European Enlightenment. *Mobility, expertise* and *network* are the three keywords which sum up his great activity, which started in the Canary Isles and took him on an educational path through Europe terminating in an eminent career in the service of both the Spanish and Russian crowns, earning him the stature of a versatile expert of international renown. He played a crucial role in the construction of a new identity for the engineer based on a series of specific skills provided within a highly institutionalised framework and put at the service of public interest: he managed groups of experts, founded schools for engineers and technical corps, organised and piloted teaching and research works in various fields of engineering, initiated theoretical studies of technical phenomena (steam engines, systems of small navigation), new disciplines (foundations of thermodynamics, science on machines) and scientific schools (applied mechanics). His mobility, fruit of political conjunctures and personal circumstances which, in the last part of his life turned into exile, developed, stimulated and inspired his many interests; he spent two thirds of his life travelling. Four major capitals welcomed him at different periods of his life: Madrid, Paris, London and Saint-Petersburg. Each in its own way, gradually formed and refined his professionalism, and we will provide a detailed account of the specific impact he had on the technical culture of the engineer. Through examination of his travels, from formation to action we shall describe his wide network of multinational relationships which testify to an extensive range of different figures: engineers and inventors, mechanics and entrepreneurs, scholars and artists, diplomats and dignitaries, including ministers, heads of government and sovereigns, as we navigate with

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him through the different worlds he brought together… Moreover, his complicated relations with powerful figures allow us to measure the limitations to competency which power, politics, intrigue and expatriation were able to exert.

Keywords

Augustin Betancourt · Spain · Russia · Technological transfert · Public works · Steam engine · Circulation of knowledge · Industrial espionage · 18th and 19th centuries

1 Introduction

Augustin Betancourt (1758–1824) is an emblematic figure of the Spanish Enlightenment. He was, indeed, a versatile engineer, savant, inventor, pedagogue and science manager, who played a prominent role in the promotion of civil engineering at the European level.[1] From this point of view, this Canarian of noble lineage, trained in the best metropolitan institutions, is a paragon of a "travelling learned mediator", whose mobility, be it voluntary or forced, invariably served the cause of globalization in his professional field.

In the midst of a Europe agitated by the political and military cataclysms of the late 18th and early 19th centuries, the personal path of this man appears both typical and singular (Fig. 1). Typical because it was part of the movement in which countries in need, in particular, Spain and Russia, would send people to the various European technical centers of excellence to be trained and mobilized in line with the accelerated modernization strategies that were underway at the time. Singular because the specific circumstances of his life prompted this active and enterprising man to develop original initiatives that sometimes went well beyond his own performance and initial aims. During his peregrinations, Betancourt had an opportunity to experience activities of all kinds: he piloted groups of experts, founded engineering schools, technical corps and technical administrations, organized and headed teaching and research in various fields of engineering art, and promoted some pioneering theoretical studies of technical phenomena (the steam engine, systems of small navigation), new disciplines (foundations of thermodynamics, science on machines) and scientific schools (applied mechanics). But the same man also had an inveterate taste for invention and free enterprise, and his curiosity as a mechanic led him to go so far as to ignore prohibitions—technical and industrial espionage was one of his life-long favourite occupations.

[1]This chapter synthetizes the guidelines of the monographic study devoted to the life and work of Augustin Betancourt: (Gouzevitch I., 2018).—The general issues presented therein were the subject of preliminary analyzes in: (Gouzevitch D., Gouzevitch I., 2008-1; Gouzevitch I., 2010).

Fig. 1 Augustin Betancourt y Molina. Engraving. 1826

During his working life, Betancourt invested in many technical branches: textiles and metallurgy, mining and dye chemistry, agricultural techniques and minting, dredging of water courses and steam technologies, clock-making and measuring instruments, optical telegraphy and mechanics, hydraulics and hydrotechnics, public works and architecture, urban installations and city planning. A pioneer in many innovative fields that will be presented throughout this chapter, Betancourt was too versatile to leave a definitive mark on any one of them. He was a poor entrepreneur, because public recognition of his intellectual achievements interested him much more than the financial benefits they could provide. Ultimately, however, Betancourt succeeded in taking advantage of his accumulated experiences in the interest of others, indeed, of many others, because his disciples and followers across Europe are too numerous to count. It is enough to mention all the promotions of the *Escuela de caminos y canales* in Madrid or of the *Institute of the Engineers of the Corps of Ways of Communication* (Institut Korpusa Inzhenerov Putej Soobshchenija) in Saint-Petersburg, which still now claim this heritage … A man of the Enlightenment, Betancourt is an image of his time, but also, synthetically, an image of the experiences that, in relation to his tastes, passions and external conjunctures, he made his own. He was a tireless traveller. His mobility enhanced his numerous interests, stimulated them, and was inspired by them: he spent two-thirds of his life on the road. However, from youth to old age, his travels changed in nature, and in this study, we will try to understand the meaning of this evolution.

Four major European capitals welcomed Betancourt at different periods of his life: Madrid, Paris, London and Saint-Petersburg. Each in its own way inspired, structured, shaped and refined his professionalism. Detailing their specific contributions to the technical culture of Betancourt will be part of our prerequisites. These contributions have different meanings depending on whether we are discussing the "Paris – London" axis, central to Betancourt's training and professional development, or the "Madrid – Saint-Petersburg" axis, essential for understanding the differentiated application of acquired experiences. The latter, in its practical applications (the promotion of training, enrollment and administration for the engineers of public works, first in Spain, and then in Russia), will be the focus of the second part of this overview.

Notably, the concept of expertise, in its polysemous complexity, played a fundamental role in Betancourt's mediation activities, even if his own line of thought took a different shape, as he used it systematically for his own work by giving priority each time to the proceedings best suited to the occasion. He acted as an expert when officially called upon by his positions, or informally when he considered it necessary, or was solicited by colleagues. He also acted as an intermediary among individuals, institutions and/or decision-making structures (academies, administrations, governments). Finally, he himself invented and promoted the expert bodies, high places of control, decisions and normalization that were given full authority. Two original instances, the Hydraulic Committee (*Gidravlicheskij komitet*) and the Commission for Projects and Budget Estimations (*Komissija proektov i smet*) in Saint-Petersburg, which crowned his work in Russia, fully embody this expert approach that issued from the synthesis of Betancourt's European experiences in the fields of engineering, art and sciences.

Efficiency in the promotion of projects, be they small or large, individual or collective, modest or ambitious, formed the basis of Betancourt's work: his action was measured by the extent of his multiple contacts within the world of European science and technology. Wherever he went and whatever he undertook, he operated as a network man who interacted intensely with those around him. Thanks to his travels, he became a mediator, activating new links while sustaining and strengthening already existing ones. If Betancourt's social skills were in line with his temperament, they were also part of the habitus of the men of science and technology of the Enlightenment, reflecting their universalist and associative culture. Betancourt, for his part, succeeded in acting with prodigious efficiency and had an eye for the future. In Russia, his European network was mobilised to set up a training system for the engineers of the future, who would be better prepared and more efficient than the developer himself. Following Betancourt in his peregrinations, from training to great action, we will inevitably address his multinational network of relations across a wide range of expertise: engineers and inventors, mechanics and contractors, scientists and artists, diplomats and high-ranking officials, including ministers and chiefs of governments, or even sovereigns… At the same time, his personal failure to serve the Russian Crown, and previously that of Spain, testifies to the limits that power, politics, intrigue and expatriation can impose upon competence, an aspect that will be examined in the last part of this chapter.

2 The Universe of Travels: Modalities, Temporalities, Causalities

Travels to France and England took on an important, if not central, place in Betancourt's life. They represent more than thirteen years, that is, nearly a quarter of his adult life, which began with his arrival in Madrid in 1778, at the age of twenty, and ended with his death in 1824 in Saint-Petersburg, at the age of sixty-six. Compared to his Spanish period (1778–1808), this segment of his travels is even more significant, since Betancourt spent about 54% of his service time in France and England. Between 1784 and 1808, extreme dates that flank this period of intense mobility, the engineer made eight visits to these two countries, six to France and two to England.

These sojourns of various duration, from three weeks to six years, follow one another at more or less tight intervals, relatively close at the beginning and at the end of the aforementioned period, with a break of nine years, from 1798 to 1807, during which he was occupied by various works and achievements in Spain. Without marking a break in Betancourt's attitude towards these two countries and towards travel in general, this pause is indicative of the changes that were occurring in the nature of his mobility. The official missions financed by the State before 1798 gave way to an adventurous escapade of 1807–1808, which he undertook at his own risk in search for a way out.

From a biographical and circumstantial point of view, these two groups of travels are therefore considerably different, both in their material and administrative conditions, as well as in their intimate motives and final aims. The man who travelled to France and England between 1784 and 1798 was in his prime (26–40 years old), dynamic and enthusiastic, curious and ambitious, but, above all, eager to serve his country usefully and make a good career there. France and England thus served as sources of information, ideas and inspiration, springboards for social advancement, and open doors to new horizons. In contrast, the man who took refuge in France in 1807 and 1808, with a prospective trip to Russia in between, was already nearly 50 years old, and although his creativity was more vibrant than ever, his youthful dynamism had disappeared, consumed by age, trials and disillusionment. His former enthusiasm gave way to the determination of the mature man whom political anguish, economic difficulties and professional frustration had pushed into expatriation.[2] During this second period, France served him one last time as a stopover on his way to a new destiny—Russia.

All of these travels, however, have in common an abundance of intense and creative activities. These activities are mainly of eight types: studies (stays in scientific institutions, laboratories, workshops, educational visits, etc.); inventions (descriptions, projects, static or operational models and/or life-size objects); scientific works (academic memoirs and treatises); industrial initiatives (memoranda and proposals arguing the advantages of the introduction into Spain of various industries or, in some cases, essays of exploitation); educational initiatives and the organization of collective work (teaching projects and supervision of trainees); commissions (acquisition of equipment, teaching materials, scientific instruments, models, books); commercial mediation (for example, as a commercial agent to the clock master Abraham-Louis Breguet); and reconnaissance and espionage (collection of information on various technical inventions and industrial innovations, in the interest of States, administrations and individuals). At the same time, each instance of travel has its own characteristic, and to better understand the peculiar and summary impact of each one on Betancourt's life and work, I shall examine them one by one.

The first voyage by young Betancourt to France, from March 1784 to July 1785, was a result of his first great professional success. Three brilliant memoirs on the mercury mines of Almaden issued from his inspection of this enterprise of the Spanish Crown in 1783 established him as an expert in mining and led to the granting of a fellowship of the Secretariat de Indias[3] to study underground geometry and architecture in Paris[4] (Fig. 2). On his way to France, Betancourt, unofficially commissioned by his chief in Madrid, inspected the Aragon Channel (Canal d'Aragon),[5] a very ambitious building enterprise of the Spanish Crown, and this visit, as well as his having made his first Parisian contacts, resulted in an unexpected turn during this stay. In view of the teaching offered at the *École des Ponts et Chaussées*, directed by the famous French engineer Jean-Rodolphe

[2]In his letter of September 15, 1814, from Saint-Petersburg, Betancourt explains his motivations to his brother, José de Betancourt y Castro, in the following terms (transl. from Spanish by I.G.): «Since I observed the enmity that reigned in Spain between the Prince of Asturias (now Ferdinand VII) and Godoy, I assumed that there must have been a revolution in Spain and that in such a case it would be necessary, in order not to perish with my family, to seek asylum in a foreign kingdom […] where we could be safe, and it seemed to me that Russia must be the most suitable. I saw the storm coming and after Napoleon had requested troops from Spain and […], it seemed to me that it was already time to leave; and as at this time any individual who enjoyed some consideration was leaving the Court, I was granted permission to travel at the instant I requested it» (AHBC, 1814). Published in: (Cullen Salazar, 2008, p. 206). Betancourt fails to mention here at least two other reasons that conditioned his departure: on the one hand, the loss of his favours with Godoy (following the unsuccessful reconstruction of Soto de Roma, Godoy's domain in Andalusia) and, on the other hand, his financial setbacks due, in particular, to the failure of his business, the Ávila cotton factory. See: (Muñoz Bravo, 1987; Martín García, 1988).

[3]Governmental instance managing overseas affairs in eighteenth century Spain.

[4](Betancourt-2; Id.,2009).

[5](Sáenz Ridruejo, 1978; Rumeu de Armas, 1967; Id., 1968).

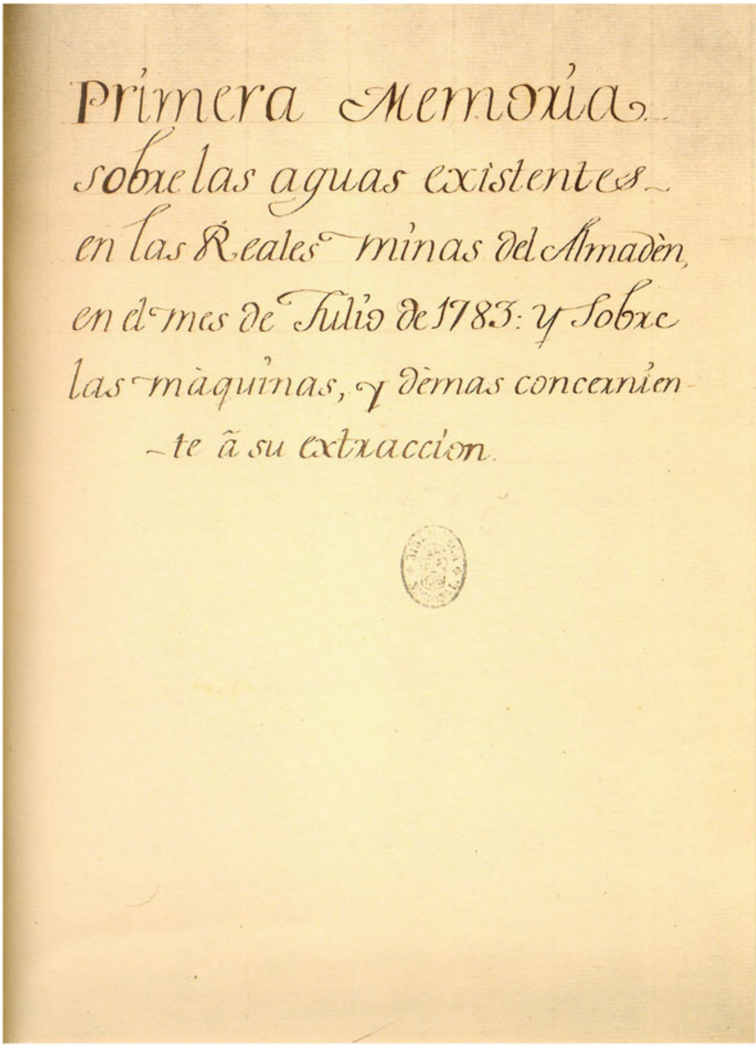

Primera Memoria
sobre las aguas existentes
en las Reales minas del Almadèn,
en el mes de Julio de 1783: y sobre
las màquinas, y dèmas concernien-
-te ã su extraccion.

Fig. 2 Memoir of Almaden. Volume I. Cover. 1783

Perronet, the young traveller formulated a new project, more in line with his interests in mechanics and hydraulics. In the memoir submitted to the Spanish Ambassador in Paris, Aranda, Betancourt proposed organising a similar course of education in Spain aimed at promoting a new class of technical experts with specific knowledge, that of engineers-hydraulicians likely to undertake the construction of roads and canals in the kingdom. The proposal was approved by Carlos III. As a result, in September 1785, Betancourt was entrusted with a threefold aim in Paris, obliging him, firstly, to engage in, with a group of fellows of the Spanish government under his direction, the course at the École des Ponts et Chaussées in order that they might all obtain the title of engineer-hydraulician; secondly, to acquire, at this school or another similar centre, a more thorough specialization in mechanics; and finally, to establish a collection of models of machines of general use for public works and industry, with the idea that the collection would serve as an annex to the project of the school. All these operations were supported by the Spanish Crown (Rumeu de Armas, 1980, pp. 62–65).

Betancourt's second stay in France, which this time lasted more than six years (1785–1791), was entirely dedicated to the fulfilment of this new mission. It also gave way to a new form of travel, the so-called "hydraulic team", an initiative of the Spanish government inspired and spearheaded by Betancourt in France, which, as far as we know, would seem to be without antecedent, since, unlike the classic "grand tour", the "hydraulic team" was a collective sedentary enterprise in the sense that its members had a fixed residence from which they traveled back and forth. Between 1786 and 1791, Betancourt welcomed and directed a group of his compatriots in Paris, selected according to the required skills in mathematics, technology and the construction of models: Tomàs de Verí, Juan de la Fuente, José Betancourt y Castro (brother of Augustin who joined the team spontaneously), Juan López de Peñalver, Joaquin de Abaitúa, Juan de Mata Mollero and the modeller Antonio Alvarez. Betancourt took care of everything and personally managed a daily organization of collective work, which included, besides the school courses and the manufacturing of models, a series of local trips of which he had to inform his Madrid overseers.[6]

For the spring/summer of 1788, he planned trips to Burgundy and Normandy for the fellows, to Normandy and Brittany for his brother and himself, and, finally, to England for himself alone. On the missions of the fellows, information is lacking. In Normandy and Brittany (May-April 1788), Augustin and José Betancourt visited "almost everything to be seen public as secret",[7] in particular, harbour facilities of all kinds in Brest, Lorient, Saint-Malo, and Cherbourg, to mention but a few, and focusing on the berthing and rigging systems developed later by José in Spain[8] (Fig. 3).

As for the mission to England conducted in November 1788, its consequences still arouse study and debate. During this stay, indeed, Betancourt fathomed, and later made public, the secret of the double-acting steam engine. His first trip to England was therefore largely devoted to the quest for this performant and the most efficient of James Watt's inventions. Its material conditions, as well as its character, pose a problem for historians to this day.[9] It seems that this mission received double funding, from the Spanish Crown (as part of the official mission) on the one hand and from the Périer brothers, mechanics-contractors and good acquaintances of Betancourt in Paris (in the interest of their own business) on the other. Whatever the

[6]See, for details: (Gouzevitch I., 2009; Gouzévitch I., Gouzévitch D, 2010).

[7](AHBC, 1788). Published in: (Cullen Salazar, 2008, pp.78–80).

[8][AHBC, Plano de la fábrica …]. Published in: (Cullen Salazar, 2008, p. 130); (Gouzevitch I., 2017).

[9]See, f. ex.: (Payen, 1969; Id., 1965; García-Diego y Ortiz, 1988; Rumeu de Armas, 1980).

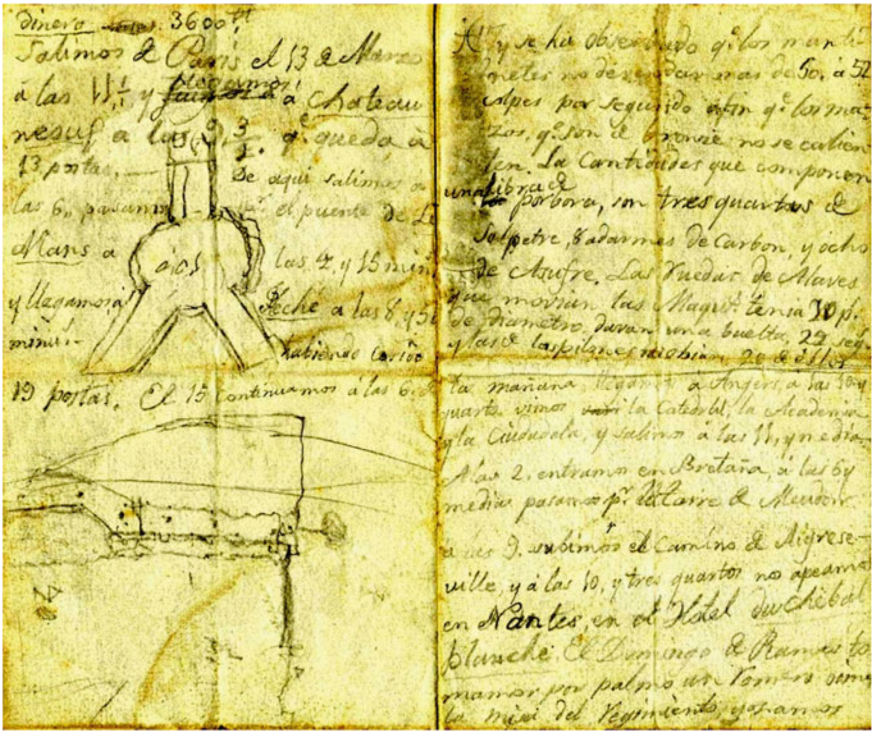


Fig. 3 Notas a lapiz de un viaje por Bretaña (Francia) realizado el 13 de marzo de 1788 escritas por José y Agustín de Betancourt y Molina, residentes en París. Fragment

source of funding, it was basically an act of espionage. The barely legal way that Betancourt accessed the secret machine (he observed it for a few minutes, from behind a wall, the day before his departure from London) leaves no doubt about it. Nevertheless, the result he obtained from this sketchy information is solely due to his talent as a mechanical engineer, coupled with the imagination of a good draughtsman well aware of geometry and his expertise in machine construction. Indeed, even his most virulent opponents admitted that Betancourt did not copy Watt's device, but rather reinvented it from the unusual outline of the cover that dissimilated the engine and from some other visible elements. He therefore created his own know-how out of his own specific skill (Fig. 4). It must also be admitted that, although Betancourt may have received commissions for the service rendered to Périer, his personal ambitions ostensibly leant towards public recognition, particularly in French academic circles, from international experts both in the world of science and in the universe of invention and industry.

As a young commissioner of the Spanish Crown hoping to make a career in his homeland, would he have been likely to seek greater gratification for this "exploit" than that granted him through Gaspard Riche de Prony's publication of

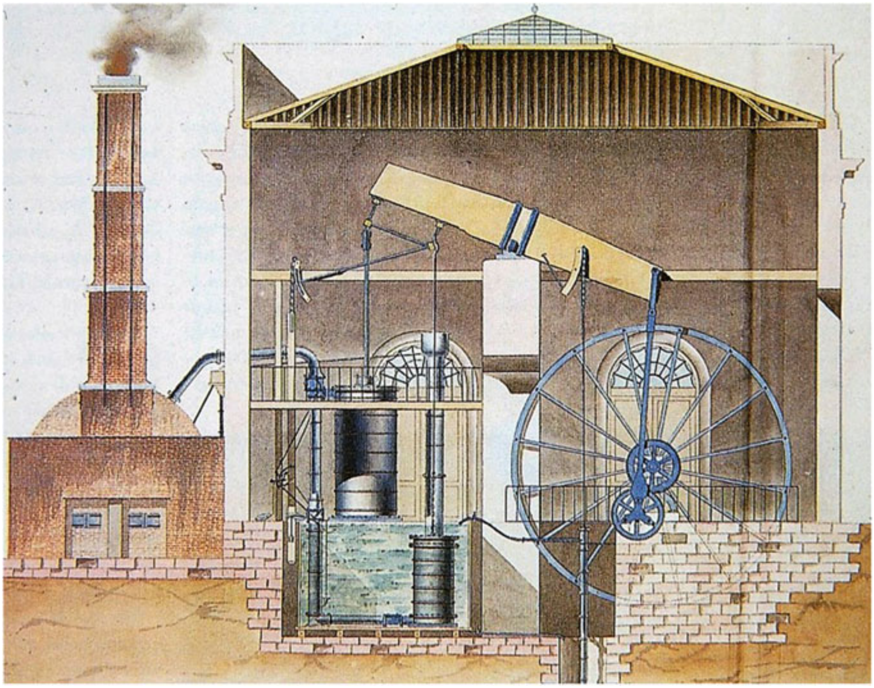


Fig. 4 A. Betancourt. Double action steam engine. 1789. Fragment

Betancourt's description of the double-acting steam engine in his *Nouvelle architecture hydraulique* (Prony, 1790–1796), regardless of Watt's feelings on the matter?[10] Meanwhile, the model of the steam engine completed the collection of machines destined for Spain, where it turned out that nobody was interested.[11] Consequently, this trip by Betancourt to England may be considered as one stage of his official French mission, both in view of its aims (seeking a specific mechanism of didactic, industrial and academic interest) and its achievements (project, model and scientific paper).[12] Taken together, these two trips allowed the engineer to carry out various activities: studies, inventions, research, industrial and educational initiatives, commissions and reconnaissance, activities that, in one form or another, he

[10]In 1807, James Watt was elected, in competition with Betancourt, foreign member of the class of mechanics at the Paris Academy of Sciences. Betancourt was elected the following year. In this way, the French academicians tried a posteriori to fend off the frustrated ambitions of the British inventor. See: (*Index biographique*..., 1979, pp. 69, 134, 504; *Procès-verbaux*..., 1913, t.1, p. 504 (séance du 2 mars 1807); Ibid., t.4, pp. 77, 78, 279, 286, 331 (séances des 13, 20.6.1808, 27.11, 5.12.1809, 12.3.1810); AAS, séances des 20.6.1808, 5.12.1809).

[11]For a revisited history of this event, see: (Gouzévitch I., Gouzévitch D., 2007; Id., 2009; Gouzévitch I., 2012).

[12](Betancourt, 1789-1). Another copy: (Betancourt, 1789-2). Réprod. in: (Payen, 1967-1; Id., 1967-2). The model is mentioned in: [Betancourt-1].

would later develop. Therein may also be found the genesis of all the main areas of Betancourt's professional interest: installations, machine-tools and processes for the textile industry,[13] devices for cleaning water streams,[14] the chemical extraction of elements,[15] and studies on the properties of steam and its applications.[16]

The next two trips followed without interruption, as, from England, where Betancourt had stayed for three years, from November 1793 to October 1796, he went directly to France, remaining there for four months, until February 1797. The factors that led him to England are threefold. On the one hand, he was driven by his curiosity as an inventor and by English excellence in the mechanical arts, which he would use both for the benefit of the Cabinet of Machines, which he directed in Madrid, and for the benefit of his own work. On the other hand, his political sympathies also played in favour of this choice; disgusted by the atrocities of the Jacobin Terror and by the danger that his friends had experienced in France (Breguet), Betancourt was seduced by British values combining individual freedoms with the stability of the social order and the rigour of political administration. The third reason was strictly personal: Betancourt looked forward to joining his family there (his wife, Anne Jourdan, and their two children), as they had settled in London after having hastily escaped revolutionary Paris.[17]

Once in England, the engineer actively set about establishing a position for himself. With his assistant, Bartolomeo Sureda, he travelled across the country, alternating visits to factories and workshops with those to public works of all kinds, carefully noting devices and innovations that could enhance the Cabinet of Machines and stimulate his own inventions. Sureda was in charge of sketching and drawing up the plans of the most interesting objects and works.[18] Thanks to his numerous contacts, Betancourt rapidly became a part of various social networks, which included, on the one hand, outstanding British scientists, engineers and entrepreneurs (such as John Sinclair, Joseph Banks and William Reynolds[19]) and,

[13]For example, the experiments on silk bleaching described in: (Proust, 1791); éd. fac-simile: [Proust].

[14]Water pump for the Channel of Aragon (1786). (Sáenz Ridruejo, 1978).

[15](Betancourt y Molina, 1785). Reprod.: (Bonet Correa, 1988; Crabiffosse Cuesta, 1996).

[16]See a detailed study: Martin Medina, Gouzévitch M., 2008-1; Id., 2008-2; Gouzévitch M., 2009).

[17](Betancourt, 1794). Fragments publ. in: (García-Diego y Ortiz, 1975, pp. 203–205); reed.: (Id., 1985, pp. 203–205).

[18]Some of Betancourt's works of this period are known through Sureda's drawings, for example, the plan of the machine for cutting grass in rivers and waterways, reproduced in: (Cullen Salazar, 2008, p. 145).

[19](Dickinson, 1921/1922). This Sketch Book belonging to W. Reynolds has 8 drawings designed by Betancourt: « Joint for cast iron plates by Mr. Betancourt. Jan., 1796»—Ink sketch, probably full size n. 10, p. 133; «Horizontal windmill [for raising water.] Chev. De Betancourt, 1784»—Copperplate engraving, elevation and plan n. 15, p. 134; A pencil note states “for the 2nd vol. of the Architecture hydraulique by Mr. Prony.» It is, however, not to be found in that work; « I^st^sketch of River Mill by W.[illiam] R.[eynolds]. Jan. 1796. Improved by de Betancourt»—Pencil sketch; elevation and plan; no scale n. 81, p. 135; Obviously the rough sketches for the finished drawings 99, 100, 102 and 103 below scale 1.50. « Machine for cutting weeds on rivers and canals invented by A. de Betancourt. Sept., 1796.»—Aquatint; general elevation; plan and sections.

on the other, promising young mechanics. Among the English itineraries of this period (which, apart from London and Birmingham, are not documented), one destination in particular is repeatedly mentioned, especially towards the end of his stay (1795–1796)—Coalbrookdale, a small but famous locality in Shropshire, widely known thanks to the famous Telford Ironbridge, of course, but also thanks to the density and variety of its industrial activities.[20] Many of Betancourt's works (drawings, memoirs, inventions) dated in 1796 or later seem to be inspired by his visits to this place.[21] Thus, on March 28, 1796, Betancourt signed his "Explication des principales parties du moulin pour moudre le silex", accompanied by a plan of said mill anticipated to be built on the River Severn in Coalbrookdale,[22] between the lock of the inclined plan 25 and the Iron bridge (Figs. 5 and 6).

Among the works carried out by Betancourt during this period, we find projects for various devices such as excavators, dredges (Fig. 7) and transmissions for windmills, the machine for cutting grass in rivers and canals (for which he was awarded the prize of the Royal Society of Arts; Fig. 8)[23] or the "fire pump" composed of different cylinders intended to generate motion in the press for crushing sugar cane (Fig. 9).[24] This latest work, commissioned by two rich Cuban planters and carried out at the Darby ironworks run by Reynolds in Coalbrookdale, turned out to be quite a pioneering project for a next generation steam engine—the compound machine (Fig. 10). Its manufacturing became a prologue to a new adventure for Betancourt: his two failed trips to Cuba. The engineer was first invited to the Caribbean island in order to oversee the assembly and maintenance of the steam engine on site, at a sugar refinery in Seibabo belonging to the Earl of Mopox.[25] But ultimately, in spite of the private invitation by the local administration, the same Earl of Mopox made Betancourt part of his wider Cuban project

Apparently from a Spanish book n. 94, p. 138; Float wheel arranged to drive corn mill, by (?) A. de Betancourt [1796]—Coloured drawing; sectional elevation; scale 1.60 n. 99, p. 138; Details of roller and thrust bearing for 99.—Coloured drawing; front and side views; scale 1.30 n. 100, p. 138); Float wheel arranged to drive a corn mill, no date – Coloured drawing; two plans superimposed; scale 1.60; part of set 99, 100 and 103, n. 102, p. 139.

[20]On the history of this site, often called "the cradle of the industrial revolution", see: (Trinder, 2000; Hayman, Horton, 2003).

[21]Betancourt's particular interest in this place is related to his collaboration with W. Reynolds, then ironmaster at the Darby's metallurgical enterprises. The nature of the projects contained in Reynolds' "Sketch book" (note 20) further suggests that Betancourt's involvement in the projects of various Coalbrookdale Enterprises went well beyond ad hoc interventions; he did indeed participate in the work of redevelopment of the facilities and improvement of the working conditions. It can reasonably be assumed that, by working for Reynolds, Betancourt was also trying to improve his financial situation and that Coalbrookdale was his place of residence in England during that period.

[22]The original manuscript, consisting of an explanatory note and some drawings in black and white (general view and details), is held at the École des ponts et chaussées (Betancourt, 1796-2).

[23]See the archives of the Royal Society of Arts (ARSA, 1795–1796), reprod. in: (Betancourt, 1796-1). Between pp. 316 and 317: a folding board with 3 fig. titled: «The Machine for clearing Navigable Rivers from Weeds invented by the Chevalier de Betancourt Molina».

[24]Betancourt mentions this invention in his letter to Breguet of December 10, 1794. See: (García-Diego y Ortiz, 1985, p. 204).

[25]For a history of this important invention, see: (Gouzevitch I., 2018, pp. 212–242).

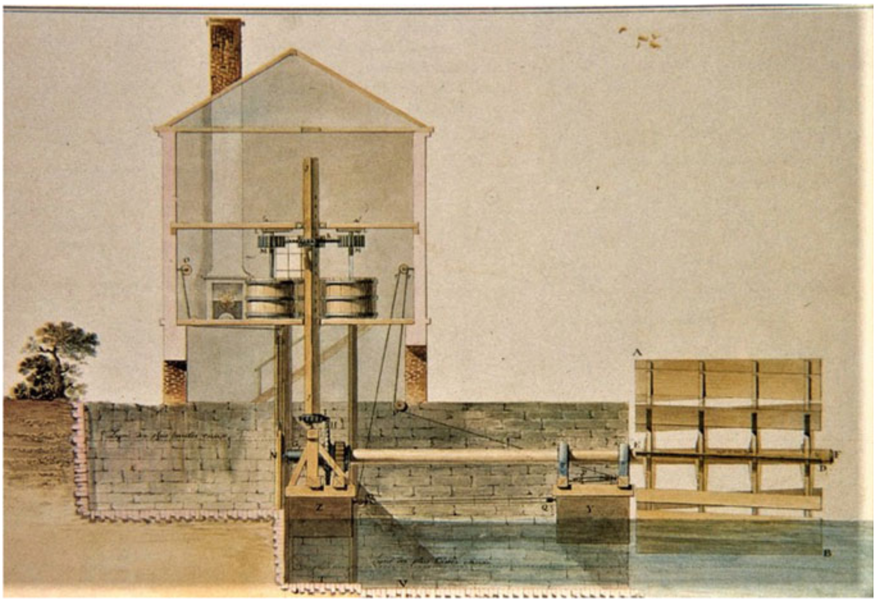


Fig. 5 A. Betancourt. Silex mill planned to be built on the River Severn in Coalbrookdale. 1796. Fragment

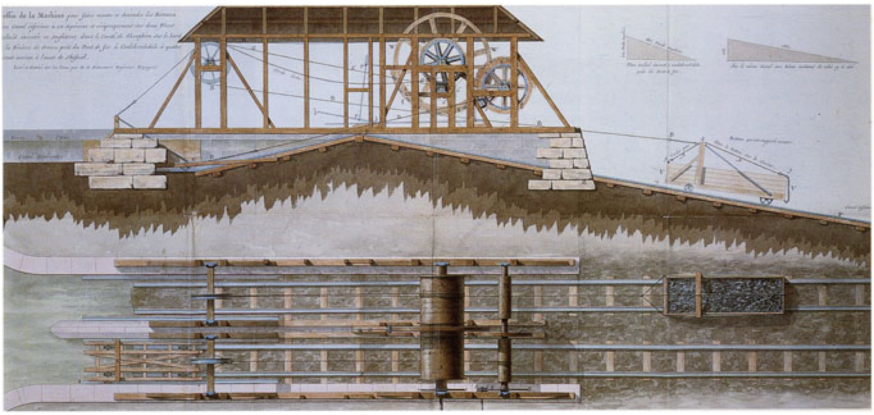


Fig. 6 A. Betancourt. Inclined Plan. 1796. Fragment

sponsored by the Spanish government, the Guantanamo expedition (1797), for which the engineer was commissioned, in addition, to purchase a large number of books and scientific instruments in London.[26] However, Betancourt missed the

[26](*Cuba ilustrada*... 1991; Tascón, 1996).

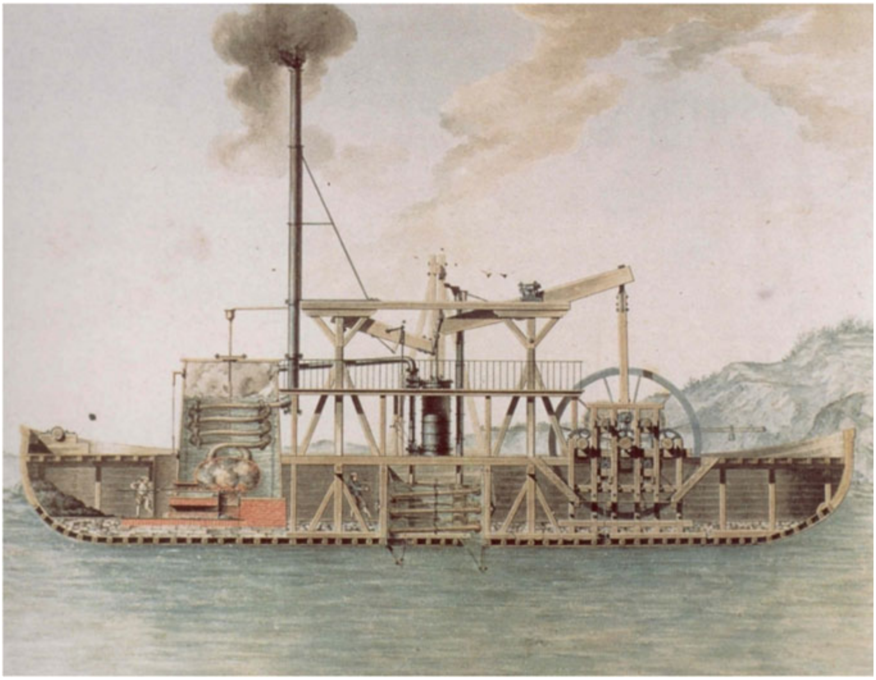


Fig. 7 A. Betancourt. Steam Dredge

departure of the expedition from La Coruña, because he was totally engrossed in another piece of work in England and France: the work, which so completely absorbed him that he would miss out on a planned trip, concerned optical telegraphy.[27]

The enormous success of optical telegraphy in England convinced Betancourt of the numerous advantages of this system and drove him to develop his own apparatus by synthesizing the advances of George Murray's English invention and the performance of Claude Chappe's system, designed in 1792 and brought to his attention by Abraham-Louis Breguet, the French inventor's co-author. Expelled from England following the break-up of diplomatic relations with Spain (Treaty of San Idelfonso, August 19, 1796), Betancourt took advantage of his passage through the French capital in November 1796 to submit to the Directoire the memoir of and plans for the optical telegraph of his own invention, in collaboration with Breguet (Betancourt, Breguet, 1797) (Fig. 11). On the benevolent agreement of the authorities, the device was tested in Meudon in the presence of Prony, who was greatly impressed with its precision, simplicity and economic assets. This initiative

[27]There is a view that Betancourt also greatly contributed to the development of the electric telegraph in Spain. However, a careful critical study of the available sources clearly showed that this is apocryphal. For analysis and argumentation, see: (Gouzevitch I., 2016–2017).

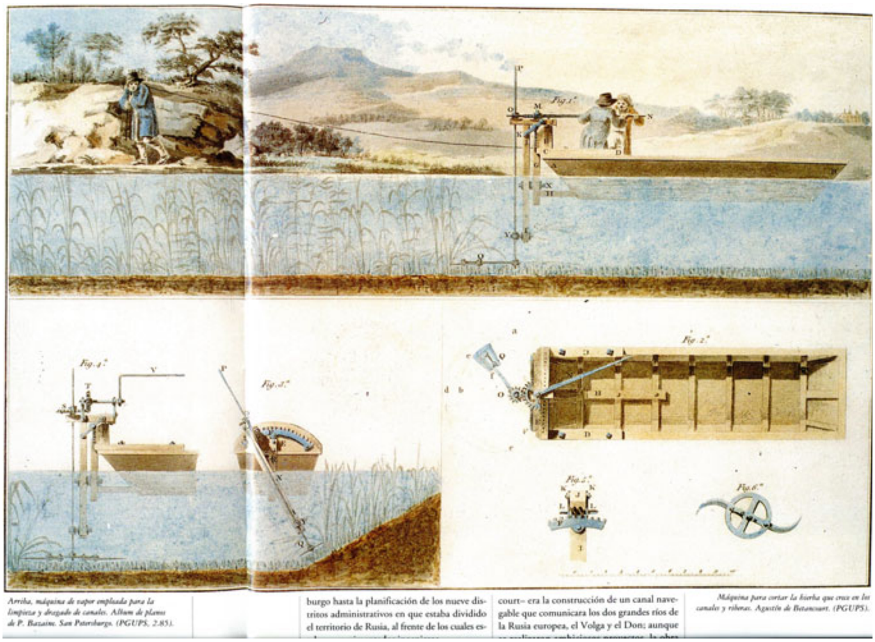


Fig. 8 A. Betancourt. Machine for cutting grass in rivers and canals

provoked the indignation of Chappe, who publically declared war on his rivals. Betancourt spent the rest of his stay in Paris fending off the attacks of the frustrated inventor. The "Réponse aux observations faites par le citoyen Chappe sur le télégraphe proposé au Directoire par les citoyens Breguet et Betancourt", dated January 7, 1797, was convincing, but the Directoire blocked the invention and archived the project. Betancourt, severely disappointed by this turn of events, finally decided to return to Madrid in order to prepare his departure for Cuba and settle his marital affairs. However, he was not the type to easily give up on what he cared about. As early as October 1797, he obtained new financing from the Spanish government to reside in France, on the pretext of acquiring a collection of mathematical instruments and books "on behalf of the king", in return for those of the Guantanamo expedition seized by the British military authorities in Portugal during the summer of 1797.[28]

Ultimately, none of these commitments prevented him, once in Paris, from devoting himself "body and soul" to perfecting the optical telegraph. This fourth visit to France, which closed the series of official trips, proved to be a longer replica

[28]Indeed, Betancourt's attempt to leave for Cuba in December 1797 quickly ended in definitive failure. The ship he had taken was attacked by a British frigate and captured. Betancourt was taken prisoner and grounded in Lisbon, but soon released. However, his luggage, including books and scientific instruments, was seized and lost.

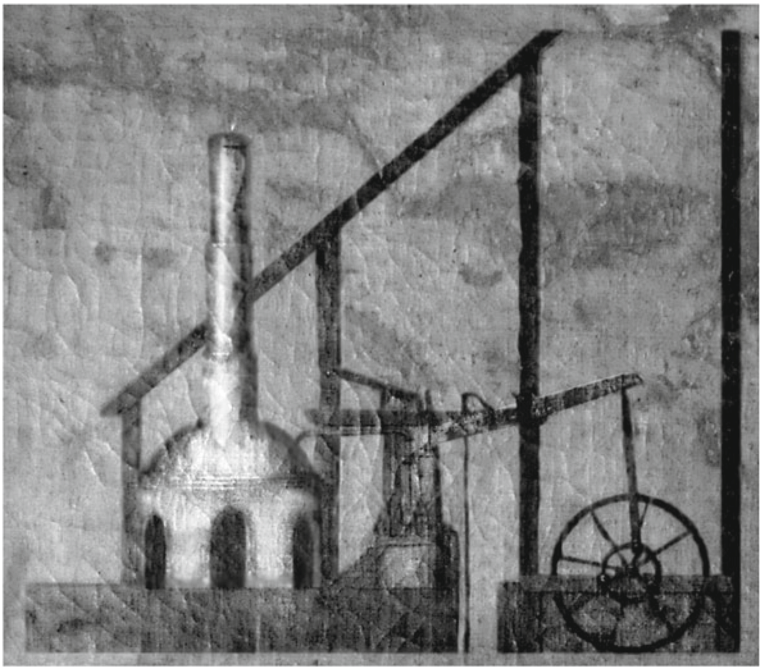


Fig. 9 Steam engine for Cuba…. Fragment. 1795

of the previous one. In fact, we find the same pervasive concern (to improve and promote his optical telegraph), the same approaches (recourse to academic expertise, experiments, public demonstrations, memoirs and academic polemics), the same setbacks (escalation of the public conflict with Chappe) (Chappe, 1797), and, finally, the same discouraging result: the definitive burial of his invention in France.[29] Since the Madrid authorities had decided to build a line of optical telegraphs in Spain (Madrid–Cadiz), Betancourt left for his motherland, and his next return to France was not until nine years later, during which time many events were to occur, not only in his life but also in the world.

The works that occupied Betancourt in Paris when he returned there in May–September 1807, and then in May–September 1808, entered a new phase during this interval. The first one concerns the diver lock—a perfectly designed hydraulic device aimed at avoiding water losses when raising and lowering ships (Fig. 12).[30] The invention itself dates from 1801, and its two models are located at the Cabinet de machines (Madrid) and the Musée de l'École des ponts et chaussées (Paris),

[29]Historians of telegraphy paid great attention to this event. See, for example: (Charbon, 1981; Id., 1988; Garcin, Narjoux, 1983). For a synthetic overview and new interpretation of this epic telegraphic story, see: (Gouzevitch I., 2020).

[30](Betancourt, 1807-1; id., 1808; Prony, 1807; Id., 1808; Id., 1809; Monge, Bossut et Prony. 1807; Id., 1808).

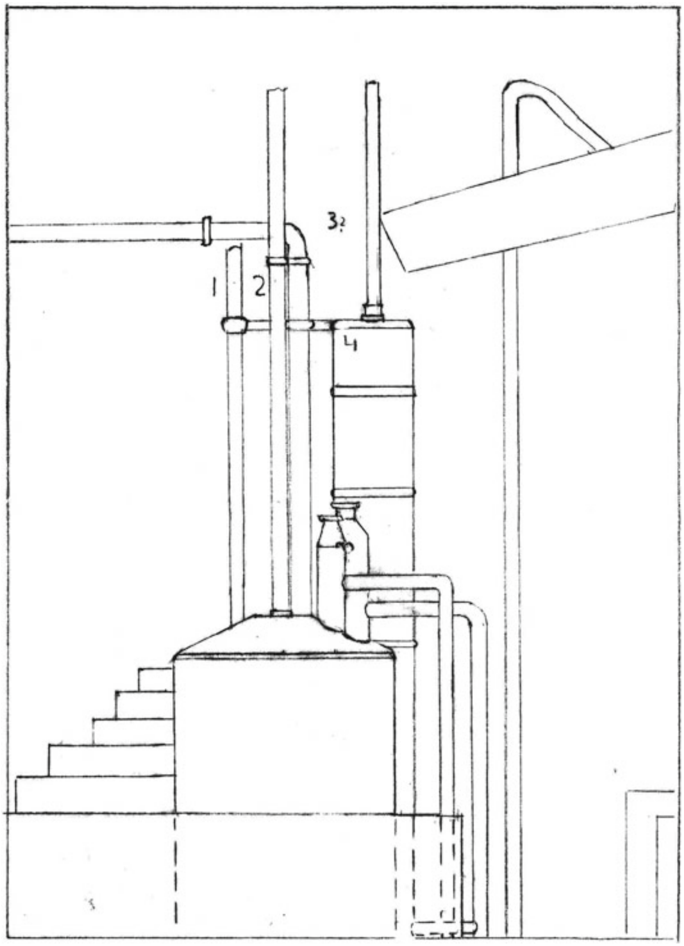


Fig. 10 Steam engine for Cuba: Dmitri Gouzevitch 's reconstruction. 2018

respectively, dated from 1802. The second of Betancourt's works of this period has an even older antecedent, insofar as the reflection on the theory of machines that he developed with José Maria de Lanz in Spain in the mid-1800s actually dates back to his first stays in France and England, and was inspired by the pioneering ideas of Gaspard Monge and Lazare Carnot on the kinematics of mechanism.[31] Finalisation of this work in the form of an academic treaty was very much a symbolic act aimed at promoting his international renown. In fact, it synthetizes Betancourt's 25 years of professional experience as an inventor, collector and classifier of machines. Both

[31](Hachette, Lanz, Betancourt, 1808; Lanz, Betancourt, 1819; Id.,, 1840; Id., 1820; Id., 1829; Fenwick, 1822). Èd. fac-simile de celle de 1808 et 1820: [Lanz, Betancourt].

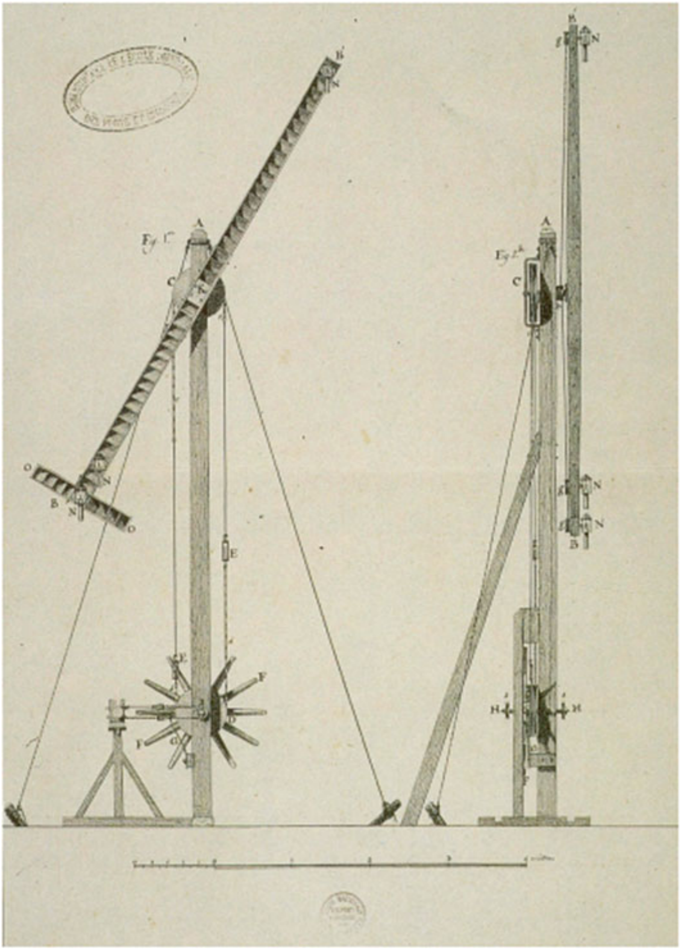


Fig. 11 A.L. Breguet et A. Betancourt. Project of optical telegraph. 1797

of these works were rewarded. The *Mémoire sur un nouveau système de navigation intérieure* submitted to the Institut National in 1807 and published soon afterwards earned Betancourt a corresponding membership in the mechanical section of the first class of this company (Betancourt, 1807-2). As for the *Essai sur la composition des machines*, submitted in 1808 for consideration by the Conseil de l'École Polytechnique and published at the expense of this institution during the same year, it was the founding work of a new science that placed its authors, Lanz and Betancourt, among the leading figures in European engineering (Fig. 13).[32]

[32]For the most complete analysis, see: (Gouzévitch D.,Gouzévitch I., 2015).

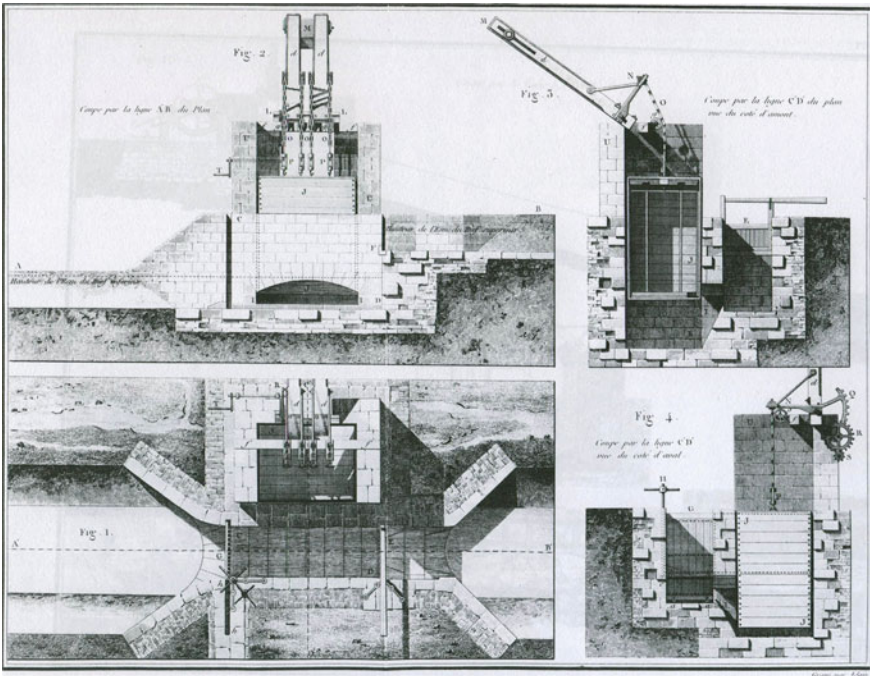
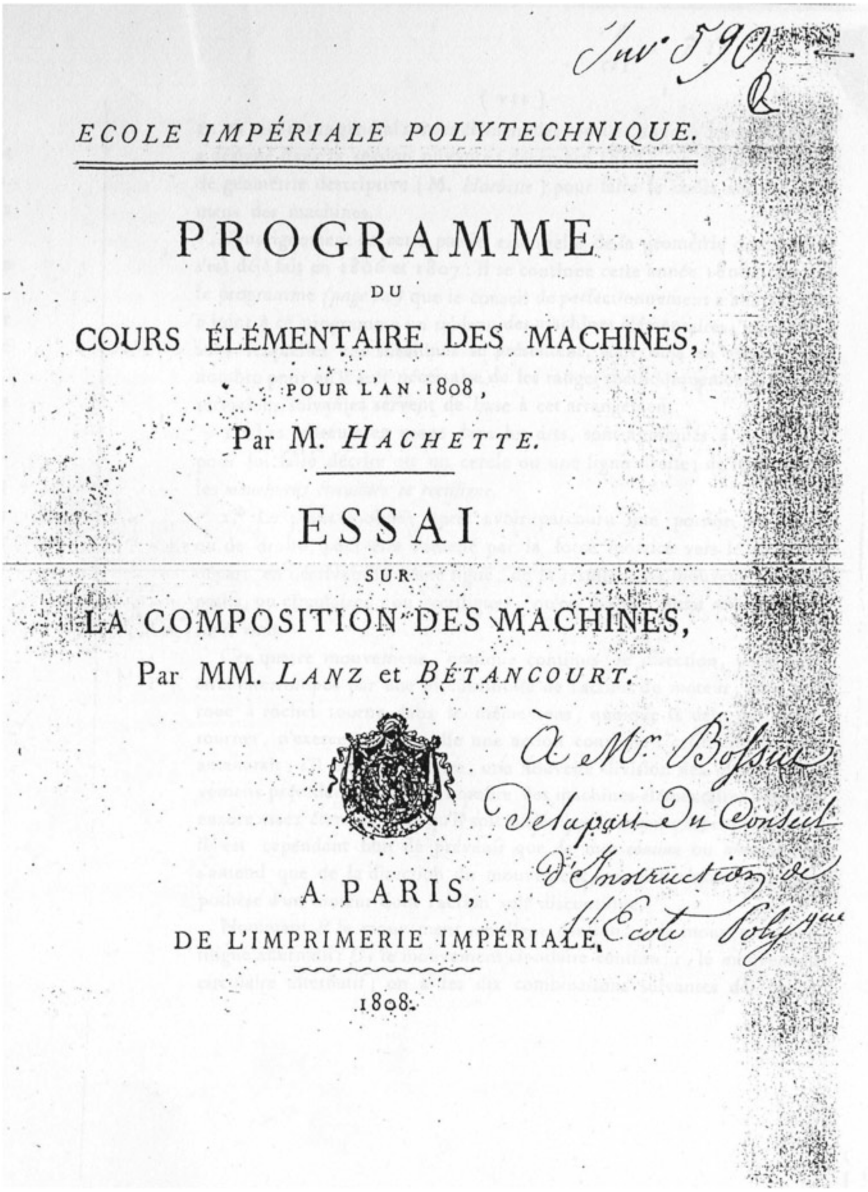


Fig. 12 A. Betancourt. Diver lock. 1807

3 The Expert at Work, or the Rise of Technical Expertise in Russia

When the *Essay* was published in Paris, Betancourt was already in Saint-Petersburg and, during his lifetime, he would never again return to France or England.[33] The extent of his responsibilities in Russia was to put an end to the escapades, and thus the flow of inventions diminished. Even if he did not completely abandon this activity, it was reduced to some interesting but narrowly fixed innovations (the steam dredge, the arches of the Kamennoostrovskij bridge or the covers of the Moscow Manege; Figs. 14 and 15). Nothing comparable to the *Essay* would be produced.

[33]Given Betancourt's status in Russia, as well as the importance and variety of his initiatives as administrator, project manager and organizer of research, citing the mass of Russian-language documents and works concerning him could clutter this overview. Having spent more than twenty years exploring this subject, I have accumulated a rich bibliography that systematically appears in my various publications in French and English. The reference to these publications in this “Russian part” of the chapter is therefore essentially intended to assist those who would like to gain a deeper insight into the subject.



Inv 590

ECOLE IMPÉRIALE POLYTECHNIQUE.

PROGRAMME
DU
COURS ÉLÉMENTAIRE DES MACHINES,
POUR L'AN 1808,
Par M. *HACHETTE.*

ESSAI
SUR
LA COMPOSITION DES MACHINES,
Par MM. *LANZ* et *BÉTANCOURT.*

A Mr Bossut
de la part du Conseil
d'Instruction de
l'Ecole Polytque

A PARIS,
DE L'IMPRIMERIE IMPÉRIALE,
1808.

Fig. 13 Essai sur la composition des machines. Cover. 1808

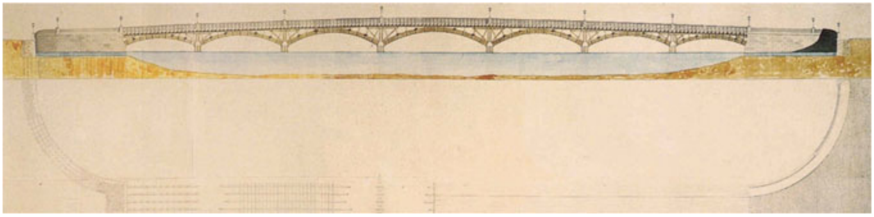


Fig. 14 A. Betancourt. *Kamennoostrovskij Bridge. 1811. Fragment*

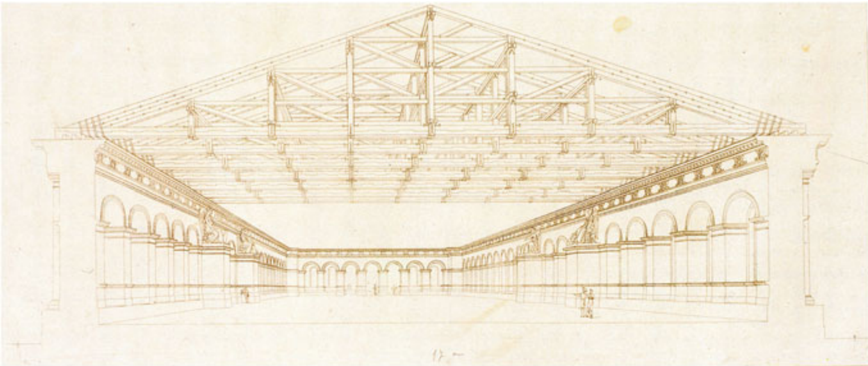


Fig. 15 A. Betancourt. Manege de Moscou. 1817. Fragment

These two passions, invention and systematization, which, until then, had filled and punctuated his existence, gave way to quite different occupations—ones that were pedagogical, administrative and organizational. His experience in the organization and management of the *Cuerpo* and the *Escuela de caminos y canales* in Spain certainly weighed in favour of his invitation to the service of the Russian Crown at a time when the Russian government was launching a reorganization of its administration of public works.[34] In a way, he worked within the scope of his

[34]Originally, the idea of entering Russian service was hinted to Betancourt by Ivan Murav'ev-Apostol, Russia's envoy in Madrid in 1801. The friendly contacts with the Apostol family were renewed as soon as Betancourt settled in Russia. Two sons of the former diplomat, Matvej and Sergej Murav'ev-Apostol, were admitted to the Institute of the Corps of Engineers of Communication at its opening (1810). However, the poor academic performance by Matvej and the ensuing dispute between his aristocratic father and the Spanish engineer on this occasion caused the breakdown of relations. Instead of encouraging his son to make his greatest effort, the dignitary supress went after the mathematics, requiring that Betancourt simplify the teaching curriculum. Betancourt ignored this claim, and Matvej had to leave the institution. One perceives the kind of difficulties that Betancourt had to face in setting up an extremely advanced system of technical education. In contrast, Sergej was a brilliant student, one of the best in his class. However, neither of the two brothers went on to embrace an engineering career. Their names are

charges in Spain, but on a much larger scale, since, there, he was involved in the organization of a big technical corps, that of the Engineers of Ways of Communication (public works), and became a promoter of an engineering school specialized in public works, the Institute of the Engineers of Ways of Communication. Moreover, he did all that was within his power to sustain the institution during its difficult period of growth.[35]

However, it was in the specific context of Russia that, thanks to his previous engineering practice, Betancourt perceived the importance there and elsewhere of the pioneering initiatives he was led to promote. These initiatives involved the creation of national structures for technical expertise that were supposed to control all construction activities in the Empire, which had increased considerably thanks to the building boom that Russia experienced in the mid-1810s.

The first of these structures, created in 1816 under Betancourt's direction, was called the Committee for Hydraulic Construction and Works at Saint-Petersburg and in the surrounding areas (the Hydraulic Committee = Gidravlicheskij komitet). Conceived with the ambition of "promoting construction in the capital", it offered an original synthesis of engineering and art thanks to the specific and complementary skills put at the service of collective expertise. One can find, among its first members, some renowned architects, such as Karl Rossi, Vassilij Stassov, Andrej Mikhaïlov II, and Antoine-François Mauduit, and three engineers, Guillaume Traitteur, Aleksandr Gotman and Pierre-Dominique Bazaine (Fig. 16). The latter, a Polytechnician and French engineer of public works (ingénieur des ponts et chaussées), invited to the service of the Crown in 1809 by Betancourt, took charge of the Committee after Betancourt's death in 1824 and assumed it for ten years, until 1834. The projects of all of the works, both those in progress and those to be undertaken in the capital, had been previously examined within this regulatory framework, which required a complementary commitment of expertise concerning all the projects involving urban planning, including dredging canals, installing rainwater sewers, paving streets, establishing anti-fire measures, and so on. Matters of embellishment and urban planning that fell within this framework were still being carried out well into the middle of the 20th century. It can be said without exaggeration that the classical aspect of Saint-Petersburg as it was formed during the 1810s–1830s is widely dependent on the continuous effort of the Hydraulic Committee, which brought together, directed and piloted the work of thousands of architects and engineers.

All urban planning at the time was part of the architect's functions. However, the development of the city in the 1820s posed problems the solution of which required specific knowledge in engineering, mathematics, hydraulics, physics and chemistry. This task exceeded the competence of architects, while the service of urban

celebrated in the history of Russia for a completely different reason: as active members of the famous Decembrist revolt (December 14, 1825), they suffered a tragic fate: Sergej was executed along with four other leaders of the movement, while Matvej spent about thirty years in exile. Correspondence of the Murav'ev-Apostol family: (GARF, f.1002, op.1, d.2-4).

[35]For the early history of the Corps of the Engineers of Ways of Communication and of its Institute, see the bibliography in: (Gouzévitch D., Gouzévitch I., 2000; Gouzévitch D., 2009).

Fig. 16 Pierre-Dominique Bazaine. Portrait. Acquarelle. 19th century

engineers had not yet been created. In the meantime, this function fell to the engineers of the Hydraulic Committee. Having received high-level architectural training, they proved themselves capable of approaching such problems in a complex way that combined the vision of an engineer with that of an urban planner and architect.

Thus, through the creation of the Hydraulic Committee, Betancourt managed to address the difficulties of architecture and urban planning in the capital for a quarter of a century to come. The second expert body he created in 1820, the Commission for Projects and Budget Estimations (Komissija proektov i smet), had, as its main task, the solution of another very important set of problems dealing with the solidity and reliability of constructions, as well as their cost. The variety of areas and the range of problems faced by the Commission strikes the imagination: bridges, wharves, locks, canals, landing sites, harbours, houses and industrial buildings, mills, churches, roads, belltowers, boats, steam engines, dredges, machine tools, pumps, artillery guns, cartographic structures, steam ships, locomobiles, snow-ploughs, railways, and so on. Documents concerning the listed fields can be grouped into three categories: projects and specifications of constructions to be carried out, in progress or already executed; inventions and discoveries of individuals, from the universal motor to the quadrature of the circle; and information sent from abroad, collected by diplomatic channels and all kinds of specialized missions, as well as articles and reports by foreign correspondents of the Department of Ways of Communication and proposals from foreign engineers and architects. Further important activities of the Commission were to standardize, normalize and unify construction works; to develop rational methods for realizing projects; and to produce normal records, guides concerning construction and maintenance standards and rules, and all kinds of manuals and normal drawings.

On the one hand, the Commission sorted out projects by eliminating all of those that looked unreal or of poor quality and highlighted errors by pushing to correct or redo the projects and budget estimations until they reached the required level. On the other hand, the Commission itself, using its enormous amount of experience, prepared and enforced the standards and rules for effecting these projects and estimations. It also insisted on the mathematization of the art of engaging in projects, and perfected the methods for the proofing of constructions, their elements and building materials. The main result of its activity was a significantly reduced number of disasters in construction due to errors by the engineers. Indeed, Russia has experienced very few such disasters. And so many lives have been saved!

These two examples are emblematic of the particular spirit that animated their founder, a spirit that combines the rationalism of the Enlightenment based on unity of the sciences with the romantic belief in the omnipotence of the individual armed with knowledge.[36] That individual's lucidity, however, goes beyond their own ambitions, because the objective is not within the reach of a single person, whatever their personal competence, but of a group of experts with diversified and complementary skills.

4 Social Network and the Construction of an Expert Authority

Betancourt's Spanish-Russian comparative experience prompts us to reflect on another phenomenon closely linked with his mobility: the creation of an international sociability network. Wherever he went, Betancourt made contacts and

[36]For the early history of these organizations, see: (Gouzévitch D., Gouzévitch I., 2005-3).

brought in his wake a multitude of people who supported him, worked alongside him and then took over. This lifelong network included, above all, technical experts (engineers, inventors, mechanics, entrepreneurs and tradespeople), but also scientists and artists, writers and art lovers, diplomats and senior officials, and, finally, sovereigns and their ministers. This network was multinational and integrated the representatives of France and Britain, Spain and Russia, Switzerland and Germany. As for the criteria for their selection to be associated with one task or another, Betancourt formulated it as follows: "I had on principle to always address the best artists…" (Betancourt, 1799). Notably, the word "artist" must be understood here in its broadest meaning, which is equivalent to "the expert", that is, one "versed in the knowledge of something by practice", and consequently "capable of judging something, a connoisseur" (*Grand Larousse…*, 1961). In short, a specialist with specific and appropriate knowledge and know-how in a given field, who has authority in their milieu. Comparing Betancourt's activities in France, England, Spain and Russia, this approach was highly selective and differentiated according to whether it involved cooperation in a project of invention and its public recognition or in the creation of an educational institution, professional administration or instance of technical expertise with respect to national interests. The list of Betancourt's contacts in France and England reflects the variety of approaches that he himself used to apply in his personal work as an engineer, inventor and entrepreneur and in his activities as a public, state servant in Spain and Russia. He logically adapted the profile of his collaborators both to the needs of concrete projects and to the conditions of a given country.

In this context, France and England serve as reference models, each of which has its own specific features. Thus, Betancourt's sociability network in England mainly included individual contacts with some outstanding mechanicians, engineers and entrepreneurs, such as James Watt, Matthieu Boulton, William Reynolds, and John Rennie. There was only one institution, the Society for the Encouragement of Arts, Manufacturing & Commerce, and, again, it was a free association of experts and patrons (which, in 1796, awarded him a prize for the device for cutting grass on the edges of canals). France, in contrast, provided two quasi-parity lists, one of individual contacts and one of institutional contacts. The first, in addition to mechanics and entrepreneurs (Jacques-Constantin Périer, Étienne Calla, Abraham-Louis Breguet, Jean-Pierre Droz, Sébastien Erard), also comprised many eminent state engineers (Jean-Rodolphe Perronet, Gaspard Riche de Prony, Jacques-Elie Lamblardie, Gaspard Monge), savants (Barthélémy Faujas de Saint-Fond, Joseph-Louis Proust, Jean-Nicolas-Pierre Hachette), including many academicians (Jean-Charles de Borda, Mathurin-Jacques Brisson, Charles-Augustin Coulomb, Jean-Baptiste-Joseph Delambre, Pierre-Simon Laplace, Joseph-Louis Lagrange), and politicians (Jean-Paul Marat, Ange-Marie d'Eymar). As for the institutions, they were all the bodies of authority—intellectual and/or political—in the world of science and technology, in France and beyond its borders, such as the Jardin des Plantes, the École des Ponts et Chaussées, the Académie des Sciences and the École Polytechnique.

In Betancourt's life as an engineer and inventor, these two experiences (French and British) followed parallel paths for a long time. In the practice of actions in which he engaged successively in Spain and Russia—and which concerned, above all, the management of major public works and the creation of institutions and administrations—they eventually intersected and merged. The comparative study of these activities suggests that this synthesis took its completed form in Russia, even if the French influence prevailed first.

The feeling is that Betancourt carried France in his baggage, in his head, in his heart, and that, without being able to return there, he took it to Russia and put it to work for all of his enterprises. French remained his language of communication in Russia. Even his entrance into the Russian service directly depended on his French experience, since, having preferred Betancourt to a renowned competitor, the Bavarian engineer Karl Friedrich Wiebeking, who offered his services to the emperor in Erfurt, Alexander I actually confirmed the choice he had made in expressing his preference for the French educational system embodied, in his eyes, by Betancourt (Gouzévitch D., 1994). And this is all the more true if one believes that the Escuela de caminos y canales was designed on the example of the Ecole des Ponts et Chaussée during its early period under Perronet. However, in Russia, Betancourt took his keen knowledge of France much further. Although it is generally known that the Institute of Engineers of Ways of Communication had fully benefited from his Parisian contacts, it is also evident that the Russian institution did not simply reproduce its Spanish counterpart, but was rather inspired by a later reference bringing together, "under one and the same roof", the École Polytechnique and the École des Ponts et Chaussées as an "application school".[37] Another fundamental difference from his Spanish experience is that Betancourt invited, as professors for his Russian institution, a group of French polytechnicians, and not his former Spanish students and colleagues who had followed him to Russia (brothers Joachim and Michael Espejo, Rafael Bauza, Agustín Monteverde, and Joachim Viado). As for his British colleagues, they first appeared only in his entrepreneurial transactions. Thus, a certain Ingram Binns took over from Betancourt in the management of the cotton factory of Àvila in Spain (the factory itself having been founded by another Englishman, Thomas Milne) (Martín García, 1988). The Brits that Betancourt knew in Russia were all entrepreneurs, manufacturers or managers of various industrial enterprises. Neither in Spain nor in Russia did Betancourt associate any of them with the teaching of future state engineers in the schools he had founded.

The picture looks quite different when we consider another major aspect of Betancourt's activity in Russia—the organization of scientific research in engineering. The multinational group of engineers and mechanics who were part of his entourage in Russia formed the origin of fundamental research in the fields of construction, transport and steam technologies.[38] The fact that Betancourt included

[37]Pour une analyse comparée: (Gouzévitch I., 2004; Id., 2000).

[38](Gouzévitch D., Gouzévitch I., 1997; Id., 2001; Id., 2003-1; Id., 2003-2; Id., 2005-2; Id., 2006-1; Id., 2008-2; Gouzévitch D., 2008; Gouzévitch I., 2008).

the famous British mechanic and contractor Charles Baird in these projects, a man who took an active part in the experiments carried out by French and Russian engineers by offering them the technical power of his mechanical works in Saint-Petersburg, illustrates a synthetic approach forged at the crossroads of his two European experiences. This synthetic spirit, based on two pillars—French theory and British empiricism—is the essence of the scientific school of Russian engineering that was then set up in the country.[39] The same approach is typical of the expert organizations mentioned above. Because, even if the British (Charles Baird, Matthew Clark, Alexander Wilson, and Adam Armstrong) were not officially members of either the Hydraulic Committee or the Commission for Projects and Budget Estimations, they intervened in most discussions concerning the major works and technical initiatives to be undertaken in the Empire.

In a more global way, the activity of Betancourt in Russia marks the advent of the modern engineer in that country. As for Betancourt himself, during the latter part of his career, he took on the role of international mediator, integrating Russia into the European professional social network. Thanks to his colleagues and students, he thus ensured his own return to Europe.

5 Some Concluding Remarks

Thinking back on this overview analysing the role of travel, or, more broadly, of either desired or forced migration, in the construction of the identity of an expert, I will conclude along two different lines.

Firstly, I will re-affirm their essential role in the life of Augustin Betancourt, man and scientist. It can be said without exaggeration that each of these stays, and even more so the sum experience, punctuating his career, from youth to old age, and accompanying his professional development, contributed to perfecting his education, refining his professionalism, forging his character and building his personality. In short, they helped him to accomplish his vocation. Their pivotal and transversal role is clear from the major initiatives he was able to deploy in Spain and Russia, as promoter of the modern educational and administrative structures for the engineers of public works inspired by the French model. Travel therefore contributed to making Betancourt an important player in technical progress in each of these countries. It also helped him to go beyond national frontiers and to become a European-sized mediator, called to weave the links of sustainable communication among individuals, institutions and States.

On a personal level, the impact of his travels in France and England seems more complex. Betancourt developed intimate and emotional ties with both countries. Moreover, he succeeded in drawing from these two experiences the best that each could offer him: their institutions, their libraries, their collections and workshops, their companies and scientific organizations, their knowledge and know-how, their

[39](Gouzévitch D., Gouzévitch I., 2006-2; Id., 2005-1).

technical and scientific achievements, and, finally, their sociability. In short, something that would today be called “a nutritive environment” conducive to creation. Merged and assimilated, Betancourt’s French and English experiences contributed to refining and disciplining this original talent, to make it bloom at the crossroads of two technical cultures, which were then referential in regards to the whole of Europe. This dual culture made him a learned expert of rather special stature who served the cause of modernization by combining the charges of a civil servant with the verve of the vocation of an inventor, but who, ultimately, sacrificed material benefits (industrial applications) in favour of intellectual recognition and public notoriety. In most cases, indeed, he finalised his work in the form of academic memoirs and, through them, sought the attention of men of science. As for applications, he mostly abandoned them to his colleagues and friends with greater business skills.

The growth of these activities contributed, over time, to transforming the nature of Betancourt’s travels. If his first trips outside of Spain were classic official missions aimed at gathering information on European technical advances, entirely in line with the modernization policy of Spain since the mid-18th century, the later ones are more reminiscent of escapes that the engineer strove to disguise as commissioned charges. Even if he performed these duties honestly, he did not hesitate at the same time to undertake his own works, since he was not eager to go back to Spain.

Betancourt’s recurrent returns to France and England, in favour of which he did not hesitate to abandon his high functions in Spain, as well as other advantageous proposals (Cuba), suggest that these stays, over time, provided him with a sense of autonomy, as necessary to him as the air he breathed, that he was guided by the unfulfilled desire to act, love and work in his own way. This brings me to my other conclusion, which concerns the complex motivations that conditioned Betancourt’s travels.

Indeed, on closer inspection, there is not a single reason for these incessant comings and goings. The freedom to devote himself to his inventions, the pleasure of communicating with like-minded colleagues, the intellectual context conducive to creation represented only one facet of this epic, while the other was personal and social. His wife and family undoubtedly played a major role in his choice in favour of mobility and final definitive expatriation. By joining in union with a foreigner, under conditions that were not particularly “Catholic”, he committed a grave social imprudence that never ceased to weigh heavily on his existence.[40] The evolution of his political opinions and social relations in Spain and France is another problem that needs to be mentioned. A liberal monarchist in his youth and with convictions that strayed far from the great problems of politics, Betancourt was so immersed in his own affairs that he hardly noticed the beginnings of the French revolution in

[40]Indeed, Betancourt married Anne Jourdan twice in the same year, 1797, first by a civil marriage in France, then by a religious marriage in Spain. However, their common life dates back to the early 1790s, because, at the time of their two marriages, they were already the parents of two children. See: (Breguet, 1983).

1789. At least, there is no trace of it in his abundant correspondence. However, the terror, which came close to striking his family and close friends in France, completely distracted him from any spirit of revolt and social contestation.

Forced to evolve in a world where the king was the law, Betancourt felt seduced by British liberalism. As a civil servant, he was entirely dependent on power, and this created great tension in his existence, torn between two extremes: the naive vanity of benefiting from sovereign favours and having state responsibilities on the one hand and the creative freedom that incessantly pushed him away from them on the other. After fleeing repeatedly from Spain, an action that inevitably led to his resigned return to the bercail, he thought he could overcome this split in Russia, having trusted in the Emperor's protection. Yet by doing so, he became caught in his own trap. For the king's servant was never safe from arbitrariness. And, like many other creative actors, Betancourt suffered its devastating effects.

This leads me, finally, to ask the fundamental question that links this man's mobility with his role as a learned technical expert and social professional mediator: what was so exceptional about his career? The study shows that, at every stage of his existence, Betancourt strove to grasp the important techno-scientific problems of the day and to propose daring solutions. Their local implementation sometimes came up against one or another of the following typical problems: lack of skills, infrastructure and materials; poor management amid political confusion; inertia of the milieu; or insufficient technical culture due to the lack of required training. Betancourt, on the other hand, was too self-confident to dwell on such trivialities. His curiosity encouraged him to constantly push back the cognitive boundaries and not mind if certain projects momentarily failed. He was confident in his art and in the omnipotence of science… Thus, his pragmatism involved a lot of idealistic and speculative dreaming, but, overall, it was perceptive, for most of his innovative ideas stood the test of time and eventually revealed their usefulness and relevance.

The originality of his approach was therefore due to the very personal, interactive and intimate relationship he had with the world of technology. This relationship, both intuitive and reasoned, was nourished by a love of art, a respect for science and a deep conviction that techniques and engineering have their own intelligence. Seen from this perspective, his life and work appear as a sustained effort to give this particular brand of intelligence a sense of nobility, visibility and fully recognised socio-professional respectability.

If one must designate his professionalism in terms of vocation, it was based on three pillars: expertise, network and mobility. This particular combination of operational modes was proper for Betancourt. Thanks to individuals like him, the Europe of engineers became a connected space. For all of these reasons, I can affirm that Betancourt, as a learned travelling mediator, owing not only to the scope of his work and the diversity of his talents, but also to his complex personality and path, unquestionably remains one of the emblematic characters of this generation of the Enlightenment, which gave origin to modern engineering in the sense that we understand it today.

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The Migration of Italian Mathematicians Between the 18th and 19th Centuries

Elisa Patergnani and Luigi Pepe

Abstract

When, in 1796, the Italian army of General Bonaparte defeated the former coalition states, many scientists joined the new governments and, with the Austro-Russian restoration of 1798, had to find refuge in France: among these were three already established mathematicians (Lorenzo Mascheroni, Giambattista Venturi, and Vincenzo Brunacci) and a very young Giovanni Plana, who had planted the tree of liberty in Voghera. Plana remained in France and became friends with Stendhal. After Napoleon's victory at Marengo, even those who opposed the French, like Paolo Ruffini in Modena, were left in their posts, and nobody was forced to emigrate. With the Restoration (1815), contrastingly, the constitutional governments were abolished, and universities and armies were downsized. Several young scientists found themselves without work, among them Agostino Codazzi, who took refuge in Venezuela and became the first modern cartographer in Latin America. The oppressive police regime of the Italian states pushed several young men into conspiracy and exile. These included Ottaviano Fabrizio Mossotti and Ottavio Colecchi.

Keywords

Italian emigration to France · Giambattista Venturi · Lorenzo Mascheroni · Vincenzo Brunacci · Giovanni Plana · Italian school of mathematics

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1 Introduction

The emigration of artists, scientists, and philosophers from Italy to various locations around Europe is not a new phenomenon, and has usually been due to changes in work or the result of political or religious exile. In 1519, Leonardo da Vinci died in Amboise, under the patronage of the king of France, Francis I. He had taken with him the *Gioconda*, which is now housed in the Louvre. Alberico Gentili and Giordano Bruno found asylum in England in their escape from the Inquisition. Caravaggio found hospitality in Malta, and the Tiepolos worked in Austria and Spain. St. Petersburg was designed by architects who had qualified in Italy (Rastrelli and Quarenghi). Mathematicians were no exception: Francesco Algarotti visited half of Europe, Lagrange lived in Berlin and Paris, and Boscovich, after the suppression of the Society of Jesus, moved to France.[1]

These were isolated cases, even if they were well-known individuals. At the end of the eighteenth century, however, emigration from Italy for specific political or religious reasons involved hundreds of people who had been politically committed to the governments created by the French troops under the command of Bonaparte, who, between 1796 and 1799, ruled a large part of mainland Italy. The consequent Austrian and Russian repression in 1799 forced patriots to choose between exile and imprisonment.

A number of scientists, among them various mathematicians who had held important governmental positions in the Cisalpine, Roman and Neapolitan Republics, were forced into exile. As for the Kingdom of Naples, about 400 patriots were condemned or exiled as “personae non gratae” (Rao 1992).

It should be remembered that, in 1798, mathematicians like Lorenzo Mascheroni, Pietro Franchini, and Ambrogio Multedo had gone to the congress that had been convened for the approval of the decimal metric system created by the Revolution, and were in contact with the most eminent mathematicians of the day, namely, Lagrange, Laplace and Monge, all of whom were part of the newly organized institutions in France (Roche 2000).

While political and scientific exile ceased under the Napoleonic governments in Italy (1800–1814), there was a concomitant rise in famous French scholars, like Gaspard Riche de Prony, Charles Dupin, and Henry Navier, who came to stay in Italy for long periods (Borgato and Pepe 2007).

Gaspard Monge had set up the National Institute of the Repubblica Romana (1798), modelled on the French *Institut*. Later, the Repubblica Italiana (1802) and the Regno d’Italia (1805) established their own national institutes. The university was reformed and the scientific teaching staff was awarded a greater number of positions (Pepe 2009).

[1]The question of Lagrange’s nationality is clarified in Pepe (2012a).

Political emigration took an upward turn after Waterloo (1815), following the demobilization of the Italian army, which had fought so bravely under Napoleon in Spain, Russia and Germany, and a similar reduction took place in the administration staff and personnel engaged in teaching and research.[2]

2 Républiques Soeurs

The arrival in Italy of General Bonaparte's army and the Commission for Science and Arts, which was made up of the illustrious scholars Monge, Berthollet, and Thoüin, saw the creation of the *Républiques soeurs*, new states that were provided with constitutions modelled on the French Constitution of Year III (Monge 1993). The latter foresaw the creation of an *Institut National* charged with promoting arts and sciences and gathering new discoveries. The particularism of the old academies was to be replaced by a community of scholars working for the country, which provided them with a salary. Politics, which was supposed to provide the guidelines and establish goals, had no say either in the means adopted to reach the goals or in the choice of people suitable for achieving them. Both these matters were in the hands of the various classes of the *Institut*. Based on the French model, and Monge's initiative in particular, the National Institute of the Republic of Rome was created, followed by the Ligurian Institute (1798) in Genoa and the Institute of the Republic of Naples (1799).[3]

The creation of the Institute of the Cisalpine Republic was complicated by both a precedent and a misunderstanding. The former derived from the Bologna Institute created by Luigi Ferdinando Marsili at the beginning of the eighteenth century, an organization that was required to replace the obsolete university courses in the field of mathematics with experimental sciences. Napoleon confirmed Bologna as the seat of the new Institute (1797), the management of which was not, however, to remain in the hands of the senatorial oligarchy of the city. A long dispute developed among the Bolognese, Emilians and Milanese, delaying the creation of the new Institute, which did not take place until after the Cisalpine Republic became Italian in 1802 (Pepe 2005; Pepe 2006).

A substantial flow of emigration to France occurred at the end of the eighteenth century, mostly due to the defeats suffered by the French army at the hands of the Austrian-Russian coalition while Napoleon was in Egypt. Scholars of literature and science who had supported the *Républiques soeurs* created by the victories of the French Armies were particularly represented.[4] Some scientists were eager to go to France to take part in the extension of the decimal metric system, others were

[2]As of March 1, 2019, Amazon.com featured more than 20,000 items under the title *Migrations*.
[3]Regarding the role of Gaspard Monge in the creation of the Institutes outside of France, see Pepe (2007).
[4]To gain an insight into mathematical research in France between the 18th and early nineteenth centuries, see: Grattan-Guinness (1990); for the relationship between science and politics in the same period, see: Gillispie (2004).

obliged to flee from Austrian-Russian repression. We shall focus on four mathematicians who left for France for different reasons: GiambattistaVenturi and Lorenzo Mascheroni were qualified scholars; Vincenzo Brunacci was a young Tuscan mathematician destined to become a leader in Italian mathematics; and Giovanni Plana was a young student whose work left its mark on the mathematical community in Turin for over half a century (Pepe 1998).

3 Giambattista Venturi (1746–1822)

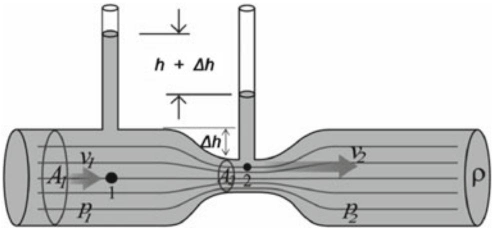
Giambattista Venturi, born in Bibbiano in 1746, completed his studies at the Seminary of Reggio Emilia, where he was taught by two eminent naturalists, namely, Bonaventura Corti and Lazzaro Spallanzani (Venturi 2005). In 1769, he was ordained as a priest and given a position as a teacher of Metaphysics and Geometry. Following the suppression of the Jesuit order, he was summoned, sometime in 1774–75, to teach Logics and Metaphysics at the University di Modena, where he also began to teach mathematics. In 1776, he went on to teach General Physics. Besides his teaching position, he also held important public offices, such as mathematician to the Duke, hydraulics engineer and inspector of the Mint (Pizzamiglio 2005).

Venturi's esteem as a teacher and technical advisor for the small Duchy brought him to the notice of Ercole III, who, in 1796, invited him to Paris as part of the delegation whose task was to negotiate better conditions of peace from the Directoire. The Duchy was, however, invaded by the Napoleonic troops, after which the ambassadorial mission no longer made any sense. However, Venturi, who had managed to become part of the Parisian cultural milieu, decided to remain at his own expense until October of 1797. In Paris, he was able to spend time at the new *Institut* and attend lessons held by the chemist Fourcroy, the physicist Charles, and the mineralogist Haüy. At the French libraries, he gained access to the manuscripts of Ptolemy's *Optics*, Heron's *Traguardo*, Leonardo Pisano's *Practica Geometriae*, and, above all, to the Codices of Leonardo da Vinci, which Monge had removed from the Ambrosiana Library in Milan and sent to the *Institut*. This study gave rise to the first work to increase Leonardo's value as a scientist: *Essai sur les ouvrages physico-mathematiques de Leonard de Vinci, avec des fragmens tirés de ses manuscrits* (Venturi 1797a).

The same year, to give support to his scientific studies, Venturi published the *Recherches expérimentales sur le principe de la communication latérale du mouvement dans les fluides* (Venturi 1797b), known as the *Venturi Effect*, a simple application of Daniel Bernoulli's theorem for the reduction in fluid pressure when a fluid flows through a constricted section of a pipe, which he expressed as follows:

$$p + \rho\frac{v^2}{2} + \rho gh = constant$$

where p is pressure[?], v velocity, ρ density, h height, and g. gravity.



The Venturi effect..[5]

The result is a decompression in which the velocity increases, for example, when the section of the pipe is restricted. This is how a *siphon* works, the applications of which are of gret importance in the field of sanitation:

On his return to Italy, Venturi became part of the *Gran Consiglio* (The Legislative Council) of the Cisalpine Republic. His greatest contribution was the *Rapporto della Commissione di Commercio sopra il nuovo campione di misura lineare* (Venturi 1798), in which he proposed that the Republic should adopt the decimal metric system and, as its linear unit of measure, the Cisalpine *braccio,* which corresponds to half a metre.[6] When the representatives from various European states were summoned to Paris the same year for definitive approval of the metric system, Venturi was seen as the natural choice for the Cisalpine Republic. The task was, however, given to Mascheroni, with whom Bonaparte was better acquainted, and Venturi returned to Modena, where he once more took up teaching physics at the university and military school. He also edited the publication of Volume III of the *Memorie di matematica e fisica della Società italiana* (*Memoirs of Mathematics and Physics of the Italian Society*), which, like the Military School, had been transferred from Verona to Modena (Patergnani 2020).

Following the Austrian occupation of the city of Modena, Venturi was dismissed and, during his short imprisonment in Carpi, he wrote his *Apologia*, in which he reconsidered his support of the Cisalpine Republic and highlighted his skills as a technical advisor while in the service of the Duke of Modena. After Bonaparte's victory at Marengo (June 14, 1800), Venturi was reinstated as Professor of Physics at the University of Pavia. However, he did not end up holding any lessons, since he was summoned to carry out a diplomatic mission in Turin in 1801. This activity became his new job throughout the Napoleonic period: from 1801 to 1813, he was sent as ambassador to Berne, where he continued his studies as both a scientist and a historian of science and, moreover, became an expert collector of prints under the guidance of Leopoldo Cicognara (Mariuccio 2005).

[5]Di HappyApple—Opera propria, Public domain, https://commons.wikimedia.org/w/index.php?curid=796158.

[6]On the introduction of the metric system and the units of weight and measures adopted in Napoleonic Italy, see (Borgato 2012).

During his last years, Venturi wrote several important works for the history of mathematics artillery, sciences, including an Italian translation of *Heron's Formula* in which he found a demonstration of the famous theorem that enabled calculation of the area of a triangle of known sides, a discovery of great use in practical geometry and revealed in the work entitled *Practica geometriae* by Leonardo Pisano (Venturi 1813). Besides unedited works by Leonardo da Vinci on water in motion, Venturi also edited the *Memorie e lettere inedite finora o disperse di Galileo Galilei* (Venturi 1818–1821). The passion for research into unedited manuscripts accompanied him throughout his life: in Switzerland, he studied a codex of *Geometria*, then attributed to Boezio, and another with the *Rei agrariae scriptores*. He was also interested in the history of artillery and improved the value of the works of captain Francesco De Marchi from Bologna who lived in the sixteenth century (Barbieri and Cattelani 2005).

4 Lorenzo Mascheroni (1750–1800)

Lorenzo Mascheroni, born in Bergamo in 1750, studied under Ottavio Bolgeni at the city's seminary. In 1773, he became a teacher of rhetoric at the *Collegio Mariano,* the state school of Bergamo, where Giovanni Antonio Tadini was one of his pupils. Mascheroni's first works were of a literary nature, but as early as 1782, he published a short essay on the isochronous curve (Mascheroni 2000).

In 1785, he published the *Nuove ricerche sull'equilibrio delle volte* (*New Research on the equilibrium of vaults*) (Mascheroni 1785), a work on statics that placed him alongside other famous mathematicians of his day, like Lorgna, Frisi, Bossut, and Couplet, who presented treatises on the same subject. Mascheroni's studies were important in the construction of the impressive dome of Bergamo's cathedral. In 1786, after Pietro Paoli's transfer to Pisa, Mascheroni obtained the chair of elementary mathematics at the University of Pavia.

There, he dedicated his studies to Euler's treatises. He took inspiration for a brief memoir (1788) from the *Methodus inveniendi lineas curvas maximi minimive proprietate gaudentes* (1744). In 1790 and 1792, respectively, he published two very important memoirs that are reference works for the study of the Euler-Mascheroni constant: *Adnotationes ad calculum integralem Euleri*. The transcendence and irrationality of this constant is still an open question for mathematicians.

In his study on the succession of reciprocals of natural numbers, Euler discovered, in 1734–35, that this one differed at the limit of the logarithm for a constant value, for which he calculated the first six decimal digits (Euler 1924):

$$\lim_{n\to\infty}\left(\sum_{k=1}^{n}\frac{1}{k}-lgn\right)=0,577218\ldots$$

He returned to the constant C in the first volume of the *Institutiones calculi integralis*, reporting the calculus of various integrals to the formulae (Euler 1913):

$$\int \frac{e^x}{x}dx = C + lgx + \frac{x}{1} + \frac{1}{2} \quad \frac{x^2}{1 \cdot 2} + \frac{1}{3} \quad \frac{x^3}{1 \cdot 2 \cdot 3} + \cdots$$

$$\int \frac{dz}{lgz} = C + lglgz + lgz + \frac{(lgz)^2}{2 \cdot 2} + \frac{(lgz)^3}{2 \cdot 3 \cdot 3} + \cdots$$

Mascheroni entrusted Tommaso Rossi, a private tutor of mathematics and philosophy at Pavia University and *Collegio Ghislieri*, with the study of Euler's constant. Rossi concluded that the constant was finite, and Mascheroni accepted this thesis. Rossi did not produce anything new in the calculus of the constant.

Mascheroni took up this calculus in the *Adnotationes* of 1790, in which he started from the results of Euler's differential calculus and integral calculus. He was able to rectify Euler's value for C, reaching the calculus of thirty-two decimal digits, of which only the first nineteen have been revealed to be exact (Mascheroni 1914, p. 431):

$$0.57721566490153286061811209008239$$

In Mascheroni's *Adnotationes*, the study of this constant was the main topic, and thus was taken up several times. The method of calculus was the same as Euler's and dealt with Bernoulli's numbers reported in the *Institutiones calculi differentialis* (1755). Euler and Mascheroni were the first to tackle this important constant with such insistency: Euler tried to express the constant in other terms (the logarithm of a familiar number), believing, therefore, that he was dealing with an irrational number. Mascheroni, on the other hand, felt that it had to be an expressible number with a finite succession of digits. The name of the constant has rightly been attributed to both of them.

In Munich, Johann Georg Soldner (1776–1833) published his theory on the transcendent function of the integral logarithm (*Théorie d'une nouvelle fonction trascendante*, 1809), calculating 32 digits for the Euler-Mascheroni constant with a different value from Mascheroni's at the twentieth digit:

$$0.57721566490153286060606065\ldots$$

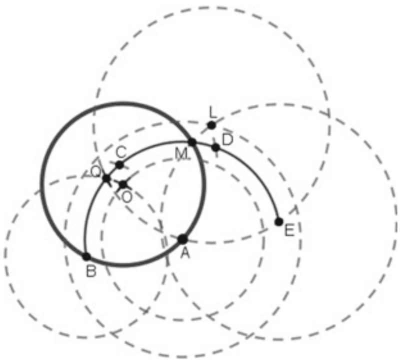
In Italy, after a lack of interest that lasted many years, the Euler-Mascheroni constant was taken up again by Giorgio Bidone in Turin (Lugaresi 2017).

In 1813, Carl Friedrich Gauss (1777–1855), in his famous memoir on the hypergeometric series, *Disquisitiones generales circa seriem infinitam* $1 + \frac{\alpha \cdot \beta}{1 \cdot \gamma}x + \frac{\alpha(\alpha+1)\beta(\beta+1)}{1 \cdot 2 \cdot \gamma \cdot (\gamma+1)}xx + \cdots$ *pars prior* (Gauss 1866), reported the calculus that his pupil, Nicolai, had carried out on the Euler-Mascheroni constant, a calculus that was different from the twentieth digit calculated by Mascheroni and in agreement with Soldner's calculation (Pepe 2012b):

$$\Psi_0 = -0.5772156649015328606065120900824024310421$$

Mascheroni, who was second to none in the history of eighteenth century Italian literature, published, in Pavia, his most outstanding literary work: *L'invito a Lesbia Cidonia* (1793), addressed to the poetess Paolina Secco Suardo, who was urged to come and visit the laboratories and the new structures of the University di Pavia.

With the arrival of the French in Pavia, Mascheroni, together with various university professors (Fontana, Barletti, and Alpruni), gave his support to the new order and announced his availability to take up public duties. In 1797, he was among those who drafted the *Constitution of the Cisalpine Republic* and, in 1798, he was the author of the *General Plan for Public Education*, which sustained the higher education at the university. In 1797, in his work *La Geometria del Compasso*, he made a dedication to Bonaparte, with whom he had had several encounters in Mombello (Mascheroni 1797). Of particular historical interest was the problem of finding the centre of a given circle using only a compass (n. 142 of the *Geometria del Compasso*). On his return to Paris from Italy in 1797, Napoleon, eager to be credited with a great interest in mathematics after his appointment to the *Institut*, attended a meeting and asked Lagrange and Laplace if they knew how to find the centre of a circle using only a compass. Noting the embarrassment of his two scientists, he approached the blackboard, where he drew a circle and solved the problem. Laplace exclaimed: "We expected everything from you except a lesson in mathematics" (Dhombres 1989):



Having placed the centre at some point A of the circumference of a given circle, with an arbitrary radius AB, less than the diameter of the circle and greater than its quarter, draw the semicircumference $BCDE$, establishing $AB = BC = CD = DE$. Let M be the point where this intersects the circumference of the given circle. With the radius EM and centres E and A, two arcs are drawn that intersect in L. With the same radius LA and the centre L, the circle BME is intersected in Q. With radius BQ and centres B and A, two arcs are drawn that intersect in O. O is the centre that is sought.

http://dm.unife.it/matematicainsieme/dopoeu/mascher.htm

In September of 1798, since approval of his public education plan had gone aground, Mascheroni was invited, as the representative of the Cisalpine Republic, to the congress for the approval of the metric system in Paris, where he remained during the Austrian occupation of Milan and Pavia, and, while there, he taught at various schools and attended the *Institut* (Lagrange, Laplace, Monge, etc.). On the occasion of the death of the mathematician and astronomer J. C. Borda, he composed an elegy in Latin: *In morte Bordae*, *viri celeberrimi* (1799). He himself died in Paris of an illness in July of 1800, shortly after Napoleon's victory in Marengo, which would have allowed for his return to Italy.

5 Vincenzo Brunacci (1768–1818)

Vincenzo Brunacci was born in 1768 in Florence, where he was introduced to the study of mathematics by Stanislao Canovai at the *Collegio degli Scolopi*. He subsequently graduated with a degree in Medicine from the University of Pisa, where he also attended courses in infinitesimal analysis held by Pietro Paoli, considered at that time to be the top expert in the subject.

In 1790, he was awarded the position of professor at the Nautical Institute of Leghorn, where, in 1790, he published an *Opuscolo analitico sopra l'integrazione delle equazioni alle differenze finite* and a translation in two volumes of the *Nuovo trattato di navigazione di Bouguer* (Livorno, Società Tipografica, 1795). In 1796, he visited the University of Pavia, where he came into contact with Gregorio Fontana and Lorenzo Mascheroni. Once back in Florence, he published *Calcolo integrale delle equazioni lineari* (Brunacci 1798). The following year, he gave his support to the French government in Tuscany, and although it lasted for only a brief period, he was given duties in the Florentine municipality. When the former government returned, he was forced into exile and fled to France. In Paris, he became part of the mathematical community of the *Institut* and came into contact with Cousin, Legendre and, above all, Lagrange, whose works had been his main reference for his research into differential and finite difference equations (Patergnani and Pepe 2021).

Following Marengo, Brunacci returned to Italy to take up teaching positions, first in Pisa and then in Pavia, where he took over following the deaths of first Mascheroni and then Fontana. In that city, he published the *Analisi derivata ossia l'analisi matematica dedotta da un sol principio di considerare le quantità* (Brunacci 1802), dedicated to Francesco Melzi d'Eril, Vice-Presidente of the Republic of Italy, in thanks for his nomination as a professor. The volume took its inspiration from *Théorie des fonctions analytiques* by Lagrange and the *Du Calcul des Derivations* by Arbogast (Strasbourg 1800) as an attempt at radical reform of differential and integral calculus, but it diverged from both of them. The various chapters of Brunacci's book, which proposes an original but, at the same time, contrived determination of mathematical analysis, deal with: progressions, continuous fractions, the calculus of finite differences, the theory of analytical functions and differential and integral calculus.

Legendre had been the first to provide, in two memoirs, a criterion for distinguishing between the maxima and minima in the calculus of variations (Legendre 1788–1789): Not only did Lagrange prove, with a counter-example, that Legendre's condition was not sufficient,

$$f(x, y, p) = p^2 + 2mpy + ny^2, n < 0$$

he also inferred Legendre's condition with greater clarity (Lagrange 1797, pp.198–220):

$$\text{if} \int_a^b f(x, y, p)dx \text{ has a minimum then } \frac{d^2f}{dp^2} > 0 \quad \forall x \in (a, b)$$

In fact, in order to calculate

$$\min \int_a^b f(x, y, p)dx \quad \text{with } p = \frac{dy}{dx}.$$

developing

$$f(x, y + \delta y, p + \delta p) = f(x, y, p) + \frac{df}{dy}\delta y$$
$$+ \frac{df}{dp}\delta p + \frac{1}{2}\frac{d^2f}{dy^2}(\delta y)^2 + \frac{d^2f}{dydp}\delta y\delta p + \frac{1}{2}\frac{d^2f}{dp^2}(\delta p)^2 + \cdots$$

The Euler Lagrange equation is satisfied,

$$\frac{df}{dy} - \frac{d}{dx}\frac{df}{dp} = 0$$

one has

$$\int_a^b f(x, y + \delta y, p + \delta p) - f(x, y, p)]dx =$$

$$= \int_a^b [\frac{1}{2}\frac{d^2f}{dy^2}(\delta y)^2 + \frac{d^2f}{dydp}\delta y\delta p + \frac{1}{2}\frac{d^2f}{dp^2}(\delta p)^2]dx + \ldots.$$

from which follows Legendre's condition.

Brunacci, who, straddling two centuries in Paris, had been in contact with both Lagrange and Legendre, may be credited with having revived in Italy a tradition of studies that owed its initiation to Euler and its law-making to Lagrange: the calculus of variations, or, rather, the study of maxima and minima for functions dependent on other functions. Brunacci devoted two memoirs to a type of function expressed by means of integrals. The first one concerned simple integrals: *Sopra i criteri che distinguono i massimi dai minimi delle formole integrali* (Brunacci 1806). He took up the conditions again in order to distinguish the maxima from the minima given by Legendre and Lagrange for integral formulas like

$$\int_a^b f\left(x, y, \frac{dy}{dx}, \varphi\right) dx$$

where φ has to satisfy a differential equation:

$$\frac{d\varphi}{dx} = z\left(x, y, \frac{dy}{dx}\right).$$

A few years later, Brunacci once more took up the question extensively in a second memoir: *Sopra i criteri che distinguono i massimi dai minimi delle formule integrali doppie* (Brunacci 1810). He proposed extending the criterion for distinguishing maxima and minima, Legendre's condition, to integrals of a function of two variables. The work, which he considered to be one of the most difficult in the history of mathematical analysis, originated from the study of surfaces verifying a condition of maxima and minima. Brunacci dealt with the matter in different steps, starting from simple integrals. He then went on to a general case:

$$F(z) = \iint_Q f(x, y, z, p, q) dxdy$$

where

$$p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$$

and Q is an area of the xy-plane.

The condition of maxima and minima is to satisfy the Euler Lagrange equation:

$$\frac{\partial f}{\partial z} - \frac{\partial}{\partial x}\frac{\partial f}{\partial p} - \frac{\partial}{\partial y}\frac{\partial f}{\partial q} = 0$$

He then examined the terms of the second order by concluding that, if z minimises $F(z)$, it follows that

$$\frac{\partial^2 f}{\partial p^2} > 0, \text{for every } (x, y) \in Q$$

$$\frac{\partial^2 f}{\partial p^2}\frac{\partial^2 f}{\partial q^2} - \left(\frac{\partial^2 f}{\partial p \partial q}\right)^2 > 0$$

And, if z maximises $F(z)$, one has

$$\frac{\partial^2 f}{\partial p^2} < 0, \text{for every}(x, y) \in Q$$

$$\frac{\partial^2 f}{\partial p^2}\frac{\partial^2 f}{\partial q^2} - \left(\frac{\partial^2 f}{\partial p \partial q}\right)^2 > 0$$

Brunacci provides two remarkable examples:

$$\iint_Q (p^2 - a^2 q^2) dx dy$$

for which

$$\frac{\partial^2 f}{\partial p^2} = 2 > 0; \frac{\partial^2 f}{\partial q^2} = -2a^2 > 0 \quad \forall x, y \in Q$$

whereas

$$\frac{\partial^2 f}{\partial p^2}\frac{\partial^2 f}{\partial q^2} - \left(\frac{\partial^2 f}{\partial p \partial q}\right)^2 = -2a^2 < 0.$$

Thus, there can be neither minima nor maxima.

The conclusion is less simple in the case of surfaces of minimum area:

$$\min \iint_Q \sqrt{1 + p^2 + q^2)} dx dy$$

The Euler Lagrange equation becomes

$$p\left(1 + q^2\right) + q\left(1 + p^2\right) - 2pqs = 0.$$

The second derivatives are

$$\frac{\partial^2 f}{\partial p^2} = \frac{\partial}{\partial p}\frac{p}{\sqrt{1+p^2+q^2)}}$$

$$\frac{\partial^2 f}{\partial q^2} = \frac{\partial}{\partial q}\frac{q}{\sqrt{1+p^2+q^2)}}$$

$$\frac{\partial^2 f}{\partial p \partial q} = \frac{\partial}{\partial p}\frac{q}{\sqrt{1+p^2+q^2)}}$$

Brunacci observes that, if the finding at the contour is linear, a function like

$$z(x,y) = ax + by + c$$

causes the minima to occur, after which follows an interminable series of calculations. In spite of the incompleteness of Brunacci's results, no other mathematician of the day (Lacroix, Dirksen, Ohm) had taken such decisive steps. Such work would have to wait until C. G. Jacobi published his memoir in the *Giornale di Crelle* (vol. 17, 1837) followed by Weierstrass (Todhunter 1861, pp. 229–243, 436–438).

Proof of Brunacci's skill as a writer of treatises was amply demonstrated in his weighty monograph in four volumes entitled *Corso di matematica sublime* (Brunacci 1804–1808). In the fourth volume, he broadly discusses the *Calcolo delle Variazioni* (pp. 166–255), and his treatment of power series in the first volume is also worthy of note.

Among Brunacci's students were some of the best mathematicians of the new generation; we may recall Antonio Bordoni, Ottaviano Fabrizio Mossotti, and Gabrio Piola, thus originated a school which dominate the mathematical research in Italy for the following one hundred and fifty years:

V. Brunacci
↓
↓ O. F. Mossotti — ↓ A. Bordoni — ↓ G. Piola
A. Bordoni ↓
↓ G. Mainardi — ↓ D. Codazzi — ↓ F. Brioschi
F. Brioschi ↓
↓ E. Beltrami — ↓ L. Cremona — ↓ F. Casorati

6 Giovanni Plana (1781–1864)

Giovanni Plana was born in Voghera in 1781. As a student, he was remembered for his sensational gesture of planting a tree in the school courtyard as a symbol of liberty on the occasion of Napoleon's arrival in Italy in 1796. As a result, he was swiftly sent away from home to Grenoble, where his relatives had a pharmacy. There, he attended the *École Centrale* and made friends with Henri Beyle (Stendhal). At the end of his secondary school education, Plana was awarded a place at the *École Polytechnique* (1800), having scored among the top students in the entrance exam. In 1803, he returned to Italy to take up a post as a teacher of mathematics at the artillery school of Turin, before being transferred to Alessandria. There, in 1809, he met the astronomers of Brera Barnaba Oriani and Francesco Carlini. In 1811, he acquired the chair in astronomy at the University of Turin and also became director of the astronomical observatory. During the Restoration period, Plana did not come up against any particular problems, and he was nominated as the royal astronomer of the new Turin Observatory. Two interesting memoirs remain from his studies in Paris: *Courbe formée par une lame elastique* (Plana 1811a) and *Sur l'integration des équations linéaires aux differences partielles du second et du troisième ordre* (Plana 1811b). Plana's most celebrated work, which fully demonstrates his skill as both a mathematician and an astronomer, is his monumental collection of treatises: *Théorie du mouvement de la Lune* (Plana 1832).

Plana's intellectual circle included all of the most outstanding figures whose scientific formation was carried out in Turin in the first half of the nineteenth century. Among these, we may mention General Luigi Federico Menabrea, the great statesman Camillo Benso di Cavour, the historian Ercole Ricotti and the famous engineer Prospero Richelmy:

G. Plana
↓

↓ C. F. Menabrea
↓ C. A. Castigliano

↓ C. Cavour

↓ E. Ricotti

↓ P. Richelmy

As for Plana's personal life, he married Lagrange's niece, Alessandra, a union that produced but one child, Sofia Plana, born in Douchet; Sofia herself died childless (Borgato and Pepe 1990, p. 45).

Plana is remembered in Turin for the prestige he brought to the Academy of Science, the University, the Observatory and the Military Academy. His manuscripts are mostly preserved at the Academy of Science in Turin (Caparrini 2000). Maquet dedicated one whole volume to his biography of Plana (Maquet 1964–1965).

Plana died in Turin in 1864, in time to see the Unification of Italy, but saved from experiencing the transfer of the capital from Turin to Florence.[7]

7 Interrupted Careers

The collapse of the Napoleonic government in Italy caused a deep crisis for the many authorities that had entered the technical branches of the army, the universities, and the complex system of bureaucracy. Most of the army was demobilised, the Restoration brought about reductions in the number of university posts (retired teachers were not replaced), and the governmental apparatus was streamlined. Thus, a generation of young, determined and active professionals, used to working in a meritocracy, saw their careers interrupted. Among these talented people who chose either exile or an uncertain return to their homeland, we may remember Ottavio Colecchi, Agostino Codazzi, and Ottaviano Fabrizio Mossotti.

Ottavio Colecchi was born in Pescocostanzo, a small village in the region of Abruzzo, to a modestly well-off family. He was a member of the Domenican Order until it was suppressed in 1809, after which he moved to Naples, where he began to publish his mathematical works: *Sulle forze vive*, *Riflessioni sopra alcuni opuscoli che trattano delle funzioni fratte* (Biblioteca analitica, 1809).

Differential calculus had been introduced to Naples in the first half of the eighteenth century by Celestino Galiani and was studied by eminent mathematicians of the kingdom like Nicola De Martino and Nicola Fergola, but only towards the end of the century had it become the subject of a published volume (Caravelli Porto 1786). Vito Caravelli had died in 1800; Vincenzo Porto had been involved in the events of the Napoleonic Republic of 1799. The teaching of differential and integral calculus at the *Scuola Politecnica e Militare*, set up in 1811 by Gioacchino Murat based on the French model, was entrusted to Colecchi, who had provided the best systematic presentation of the subject printed up to that point in the Kingdom of Naples. It also included elements of the theory of partial differential equations and the calculus of variations, which had not been present in Porto's book. We can also attribute to Colecchi the portion concerning analytical geometry in three dimensions through the study of quadrics, which may be considered the most important of his mathematical works in the Napoleonic period. This is composed of two volumes included in the S*aggio di un corso di matematica per uso della Reale Scuola Politecnica e Militare*. Colecchi wrote Volume VI: *Calcolo differenziale - Calcolo integrale* (Colecchi 1814a) and Volume VII: *Analisi applicata alle tra dimensioni* (Colecchi 1814b). Since the course is difficult to find, we believe it may be useful to provide the index of topics (Patergnani 2020):

[7]A remembrance ceremony for Plana was organised at the Academy of Sciences in Turin on May 28, 2014, including a conference held by Alberto Conte and Livia Giacardi. https://www.youtube.com/watch?v=17vH5I64XuI.

After the end of the reign of Murat (1815), Colecchi left for St Petersburg, where, in 1817 and 1818, he was actively involved in its academic life. Later, in Königsberg, he devoted his studies to the works of Kant, and was one of the first Italians to read him in the original language.

When he returned to Italy in 1819, he taught mathematics at the secondary school of l'Aquila. Having supported the revolutionary uprisings that occurred between 1820 and1821, he was removed from his teaching post. He therefore devoted himself, starting in 1829, to private teaching in Naples, at times in secret, and was persecuted for his liberal ideas and accused of being an atheist. He taught patriotic Neapolitans like Luigi Settembrini, Francesco De Sanctis, and Bernardo and Silvio Spaventa. He died in 1847, on the eve of the revolutionary uprisings of 1848; the Bourbon police forbade the press from printing news of his funeral. His philosophic output was collected in three volumes under the title *Questioni filosofiche* (Colecchi 1980). In agreement with Kant, he opposed both the philosophy of Pasquale Galluppi (1770–1846), a professor at Naples University, whose aristocratic background made him less of a target for the Bourbonic authorities, and to the idealism of Fichte and Schelling. Colecchi's scientific and philosophical influence, starting from the Neapolitan milieu, is evidenced by his impact on future intellectuals (Colecchi 1837):

O. Colecchi
↓
S. e B. Spaventa
↓
A. Labriola

B. Puoti
↓
F. De Sanctis

↓	↓
P. Villari	A. D'Ancona
↓	↓
G. Salvemini	G. Gentile

Ottavio Fabrizio Mossotti was born in Novara in 1791. His father, an engineer by profession, sent him to study at Pavia University, where, as a student of Vincenzo Brunacci, he graduated cum laude in 1811. One of his notations on the hydraulic ram had already been published in the *Trattato dell'ariete idraulico* (II ed. Milano, 1810) by his mentor. In 1813, he was given a job at the astronomical observatory at Brera, and had an important memoir published in that institution's *Ephemerides* in 1816: *Nuova analisi del problema di determinare le orbite dei campi celesti*.

Mossotti continued his career in Brera, and was also politically involved in the *Conciliatore* group. In 1823, he became part of the anti-Austrian society created by Alexandre Andryane. The group's conspiratorial activity was discovered by the Austrian police, and Mossotti was declared under arrest. Fortunately, he was not to be found in Milan and, at the urging of Barnaba Oriani, he fled to Switzerland. Later, he went to London, where he worked for some time as an astronomer. In 1827, Baron de Zach procured a post for him in Argentina as an astronomical engineer and first councilor in the Department of Topography in Buenos Aires; it was his job to manage the Practical School of Topography. He became Professor of Physics at the University Buenos Aires in 1834. In 1835, he returned to Europe and, after failing to find a job as an astronomer in Bologna, as a result of opposition on the part of the Austrian police and the Pontificate authorities, Mossotti became a professor of differential and integral calculus and mechanics at the English University of Corfù (1836). He remained in this post for fifteen years, holding a very popular course of *Lezioni elementari di fisica matematica* (*Elementary lessons in mathematical physics*) (Mossotti 1843–1845). After the reform of the University of Pisa, Mossotti obtained a teaching post there in 1841. In 1848, he was in command of the university battalion, which fought at Curtatone during the first war of independence. Later on, returning to his studies, he published important memoirs and one volume: *Nuove teorie degli strumenti ottici* (Mossotti 1857). Mossotti died in 1863, having become Senator of the Kingdom of Italy, and was buried in the *Cimitero Monumentale* in Pisa.

Mossotti's scientific work, greatly appreciated by contemporary figures like Gauss, Faraday, Zach, and Betti, as well as scientists of various generations, was collected in two volumes (Mossotti 1942–1955). Various biographical pieces have been written devoted to his role as a scientist and patriot (Patergnani 2013), as well as a volume produced by the town of his birth (Nagari 1989). Mossotti's impact has had a durative effect on mathematical research in Italy:

O.F. Mossotti
↓
E. Betti
↓

↓ C. Arzelà ↓ V. Volterra ↓ U. Dini ↓ E. Bertini ↓ L. Bianchi
↓

↓ S. Pincherle ↓ G. Ricci Curbastro ↓ C. Somigliana ↓ G. Fubini ↓ G. Vitali

Agostino Codazzi, born in Lugo in 1793, attended the military academy in Pavia and took an active part in the Napoleonic battles in Germany in 1813 (Lipsia, Hanau, etc.), as well as in the battle of Mantova in 1814 to defend Napoleonic Kingdom of Italy.

Being unable to procure a position as an officer in any of the Italian states after the Restoration, he set sail for the Orient in 1815. After a long journey in Europe, he reached Holland from Constantinople, and then set off for South America, where he fought alongside Simon Bolivar against Spain for the independence of Colombia. After returning to Lugo for the period from 1823 to 1826, he went back to South America. Columbia and Venezuela had been divided into two provinces by the Spanish. Bolivar united them, but they separated once more, and have been in conflict ever since.

For over thirty years, Codazzi played an important role in the field of military engineering and cartography. His greatest work is the *Atlas fisico y politico de la Republica de Venezuela* (Codazzi 1840). It contains historical maps of the campaign for the independence of Venezuela (1819–1826) and a geographic description of the various provinces. It was the first atlas of Venezuela and one of the first of South America. He died in 1859, in Espiritu Santo, a small Colombian town that has since been renamed Codazzi, after him. At the time, he was examining the northern territories of the state as part of the project to link the Pacific and Atlantic Oceans by means of a navigable canal, which would later be carried out with the Panama Canal. In 1843, he had been in favour of the German emigration (Baden-Württemberg) and the foundation of an isolated position, at 1796 m, of the *Colonia Tovar*, which still retains the characteristics of a German mountain village. Nowadays, it is a tourist destination not far from Caracas.

Although he is not well-known in Italy, Colombia and Venezuela compete with each other over Codazzi's memory. The Geographical Institute of the Republic of Colombia, with its headquarters in Cartagena, is named Agustin Codazzi-Bolivar. Codazzi's tomb can be found in the Pantheon of Colombia in Bogotá, alongside other heroes of the nation, and there is another monument dedicated to him in Tovar.[8]

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[8]A doctorate thesis published in Caracas was dedicated to him by Juan José Pérez Rancel, *Agustín Codazzi*: *Italia y la construcción del nuevo mundo*, Petroglifo Producciones, 2002. *Así nos vieron: Cultura, Ciencia y Tecnología en Venezuela 1830–1940*, Juan José Martín Frechilla, Yolanda Texera Arnal compiladores, Caracas, Universidad Centrale de Venezuela, 2001.

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Guglielmo Libri, Mathematician, Historian, Collector, Patriot, and Liberal

Alessandra Fiocca and Andrea Del Centina

Abstract

Guglielmo Libri, mathematician, historian, erudite man of letters, collector and seller of antique books, journalist and patriot, was one of the most important and most controversial figures in Europe during the first half of the nineteenth century, and, as such, the focus of much scholarly attention. This article is intended to shed some light on Libri's contribution to the development of the Italian collective identity and a spirit of national unity in the *Risorgimento*, through his historiographical work, which had its apex in the monumental *Histoire des Sciences Mathématiques en Italie* published between 1835 and 1841.

Keywords

Guglielmo Libri patriot · Historiography of Mathematics in Italy · 1830 French revolution · 1831 Florentine plot · 1848 French revolution

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> Qualunque siano pure state le colpe delle quali in tempi agitati, esule dalla patria in seguito ai moti del ′31, e perseguitato da odii implacabili, poté il Libri essere accusato, nessun italiano dovrà mai dimenticare tutto ciò ch'egli ha operato a prò del suo paese, e quanta parte quell'inno da lui sciolto al rinascimento scientifico dell'Italia abbia avuto nel nostro risorgimento politico. (Favaro, 1910, 21)[1]

There is a very close link between the development of Italian nationalism and the experience of political refugees. Not only did the intellectual activities that permeated the Italian national movement develop primarily outside of the Italian state, but Italian political emigration managed to turn the experience of exile into a very powerful myth (Isabella 2006). The conceptualization of myths is considered by Smith (1999) to be a necessary precondition for the development of a sense of collective identity, and in the *Risorgimento*, the myth of exile exerted great ideological efficacy.

Recreating the heroic spirit and the heroes that animated our ancestors in some golden age is considered by Smith to be the aim of an ideological myth. In this movement of construction of the myth of the exile, the character of Guglielmo Libri stands out as highly representative.

1 Libri, a Refugee in Paris and London

Guglielmo Libri Carrucci della Sommaja, Count of Bagnano, was born in Florence on January 2, 1802.[2] At the early age of fourteen, he was admitted to the University of Pisa, where he almost immediately displayed great aptitude for Mathematics and Physics. In 1820, he published his first work, *Memoria sopra la teoria dei numeri*, which was highly praised by Augustin Cauchy, the most prolific French mathematician of the time. In 1822, he wrote a second memoir on the theory of numbers, and the following year, the *Mémoire sur divers points d'Analyse*, which appeared in the Proceedings of the *Accademia delle Scienze* of Turin. Soon after, he was appointed professor of Mathematical Physics at the University of Pisa, a position he held for only a short time.

Feeling that his future lied elsewhere, as early as 1823, he had managed to have himself exonerated from teaching duties, but with the privilege of retaining title and salary, that is, to be permanently on leave; thus, in autumn 1824, finally free of academic duties, and supported by his family friend Marquis Gino Capponi, Libri left Florence bound for Paris, the most important place for mathematical research in Europe and the focus of his ambitions.

[1]"Whatever the faults of which Libri could be accused in those agitated times, an exile from his fatherland following the movements of '31 and persecuted by implacable hatred, no Italian ought ever to forget all that he did for his country and how much the hymn he devoted to the scientific renaissance of Italy has affected our Risorgimento".

[2]Libri, a controversial multi-faceted figure who excelled in many fields, good and bad, has always been the focus of much scholarly attention, and is the subject of several biographies and studies; see, for instance, (Stiattesi 1879), (Bortolotti 1934), (Fumagalli, 1963), (Maccioni-Ruju, Mostert 1995), and (Del Centina, Fiocca 2004, 2010).

When in Paris, Libri was presented to the *Académie des Sciences de l'Institut de France* by the famous naturalist Alexander von Humboldt. Here, he came in touch with Cauchy, and made the acquaintance of J. J. Fourier, A.-M. Ampère, P.-S. Laplace, J.-B. Biot, S.-D. Poisson, Sophie Germain, and François Arago, the future director of the Parisian Observatory. The Ambassador of Tuscany presented him to King Charles X, and the doors of the best Parisian salons soon opened to him, where he stood out for his brilliant conversations, not just about science, but also about politics, art, and literature. There, he met the influential politician François Guizot, who was then busy rousing the opposition against the King and who would become his future protector.

In Paris, Libri presented his memoirs on the theory of numbers to the Academy, and established two important friendships: one with Sophie Germain, who shared with him a true passion for the theory of numbers, and another with Fourier, the permanent Secretary of the Parisian Academy, through which he tried to find out what had happened to the manuscripts of ancient French geometers during the great revolution of 1789. Manuscripts and rare books were, in fact, another of Libri's passions (Libri's travel diaries are published in Del Centina, Fiocca 2010).

Shortly after his return to Florence, in the autumn of 1825, Libri wrote several memoirs, which he published in 1827 at his own expense, bound together in one volume entitled *Mémoires de mathématique et de physique*. These memoirs, which testified to his thorough knowledge of the most important works of Cauchy, Fourier, Laplace, Legendre, and Gauss, brought him recognition within the scientific community.

In February 1830, Libri once again left Florence for his second trip to Paris in the hope of giving full reign to his scientific ambitions and his need for recognition. He reached the French Capital in June, after first stopping in Milan, where he studied Leonardo's codex at the Ambrosiana Library, then in Turin, where he discussed mathematics with Giovanni Plana, and finally in Geneva. In Paris, Libri renewed his friendship with Sophie Germain and other scientists, read his mathematical and physical memoirs to the Academy, and also found time to begin his studies on Leonardo's codices preserved in the Library of the *Institut de France*.

In July, Libri took an active part in the revolution that broke out in Paris. His deeds on the barricades were commented upon with admiration by the Parisian newspapers, emphasizing his courage and disregard for danger, and it was during this period that he strengthened his relationship with François Guizot, then Minister of Education and future Minister for Foreign Affairs in the new Government.

Toward the end of November, Libri set off on his return journey to Tuscany. He arrived in Florence in the middle of January 1831 and, still imbued with of the revolutionary spirit acquired in Paris, immediately threw himself into the plot organized by some politicians and other Florentine nobles in their attempt to persuade the Grand-Duke Leopold II to promulgate a Constitution. The so-called "Berlingaccio riot" failed, and Libri was "invited" to leave Tuscany on penalty of arrest. However, thanks to the intercession of his uncle, Alessandro Humbourg, a high official of the Grand-Ducal government, he managed to maintain the privileges already granted to him. If, on the one hand, his exile was in line with the charge of conspiracy against the Government, on the other, the clemency shown by the Grand-Duke in maintaining his salary as a University professor seemed a contradiction. The Italian refugees in Paris aroused suspicions that Libri was an informer.

Having left Florence, Libri first found refuge in Lucca, then in Modena. In March, he reached Parma, where his unabated revolutionary spirit led him to take part in the newly arisen insurrection. Hunted down by the police, he fled to Genoa, from where he embarked for Marseille.

Here, Libri met Giuseppe Mazzini, with whom he struck up a friendship that, in spite of disagreements and conflicting political ideas, lasted until the final years of Libri's life. From Marseille, he travelled to Carpentras in the south of France, where he remained from June to November, being engaged in scientific and historical studies. Deprived of any means, he was supported by his friend Sophie Germain, who provided him with the books he had lost while on the run.

During his stay in Carpentras, he urged his Florentine friends to write letters in his defence, which the fascinating Hortense Allart, a friend whom Libri had known in Florence years before, spread around the Parisian drawing-rooms to dispel suspicions about him and create a favourable climate for him. In Paris, he also found financial support from Guizot, Abel-François Villemain, the future Minister for Public Education, and Arago, the most influential member of the *Institut* at the time.

At the end of November, Libri left Carpentras for Lyon, bound for Paris, where he arrived in December.

In the early 1830s, Libri was known as a brilliant mathematician, and several European academies, like those in Turin, Palermo and Berlin, had already recognised his talent, welcoming him among their members. Finally, on December 31, 1832, he received the nomination he had truly desired: he was elected correspondent of the Parisian Academy of Sciences, a matter of pride to him, as he was one of only six non-French members in the whole of Europe.

In 1833, Libri obtained French naturalization and was free to pursue a dazzling academic career. Upon the death of Adrien-Marie Legendre, the same year, a professorship at the Academy became available, and with the support of the physicist Biot, the mathematician Poisson, the chemist L.-J. Thénard and, most of all, Arago, Libri was chosen. The following year, he was appointed the chair of Probability, a seat created for him at the Sorbonne. In 1843, Libri was finally elected to the *Collège de France*.[3]

Between 1835 and 1841, Libri published the four volumes of his *chef d'oeuvre*, the *Histoire des sciences mathématiques en Italie*, a work he had been planning since his time in Carpentras, and in which all his erudition appears.

[3]Since 1832, Libri had been a substitute for Biot, and later for Lacroix, at the *Collège de France*. In 1833, when he was writing the *Discours préliminaire* for the first volume of his *Histoire des sciences mathématiques en Italie* (Libri 1835), Libri introduced a short course on the history of science into his teaching at the *Collège de France*, the first course of this sort. See (Fiocca and Nagliati, 2009).

Between 1838 and 1848, Libri collaborated actively with the French Government, mostly in matters concerning Italian politics. He also wrote several articles that, despite not bearing his name, were published in the *Journal des Debats*, the Government's official mouthpiece. During those years, he was also an assiduous contributor to the *Revue des deux Mondes*, and published various popular scientific articles.

In Paris, Libri could give full reign to his 'passion' for books and manuscripts, which he had displayed since his youth. He bought a great many items, not just at auctions, but also through private deals. By the early 1840s, his private library was already one of the most important in Europe, containing approximately thirty thousand pieces, including printed books and manuscripts. Thanks to his knowledge within this ambit, in 1844, he was appointed Inspector of French Libraries, a position that allowed him free perusal of all libraries in France. When, in 1847, he sold part of his library through a public auction, very rare books and invaluable manuscripts appeared on the market in Paris. Soon after, rumours began to circulate about Libri's alleged thefts, however, these whispered allegations were soon silenced by his influential friends, for a time.

During the February Revolution of 1848, the rumours turned into an active accusation against him. When, during a sitting at the *Académie*, it was suggested that he was at great risk of arrest, given that he could no longer count on the protection of Villemain and Guizot, Libri decided to flee to London. In England, he was safe, given that no extradition agreements existed with France. Before fleeing, Libri hurriedly sent many of his books and manuscripts to London, probably the most precious, but thousands of pieces left in Paris were confiscated by the French authorities.

At first, the London newspapers were not in favour of Libri, and various articles were published against him on the basis of the news from France, but the mood of public opinion quickly changed, thanks to the support that Libri received from his friends on the banks of the Thames. The famous mathematician Augustus De Morgan and Sir Antonio Panizzi of the British Museum, the latter of whom had lived through the revolt of Parma in 1831 with Libri, strenuously defended him. For Mazzini and Terenzio Mamiani, now refugees in London, he was a patriot.

Libri always maintained his innocence in the face of the accusations levelled at him from France, and he fought a hard battle from London. In July 1850, he was tried in absentia and sentenced to ten years' imprisonment. The following year, Libri was expelled from the *Collège de France*, relieved of all authority and salary. Libri's *affair* and trial were the subject of animated discussion in European academic and cultural circles, partly because there had been no definitive proof against Libri, and there were many who considered him a victim. De Morgan wrote several articles in the *Athenæum*, and other journals, in which he declared Libri innocent. This was so that, after the French court declared Libri guilty,[4] he could obtain the rights of British citizenship.

[4]Proof of his guilt as regards the French trial was ascertained only in 1878, by Léopold Delisle, General Administrator of the National Library of France, after the death of Count Ashburnham, to whom Libri had sold part of his collection of ancient codices in 1847.

In London, Libri resumed his historical and bibliographical studies and was a frequent visitor to the British Museum, in particular, attending the reading room of the British Library, but he devoted himself primarily to reviving his trade in books, including through agents who acted for him all over Europe. In less than nine years' time, he was able to collect a rich new library. In his view, this would show the world that his abilities as a bibliophile and trader had allowed him to form the precious collection owned in France, not the alleged thefts from the French libraries.

In the memoir about De Morgan written by his wife Sophia Elizabeth, she underlined that there was another reason for Libri's unpopularity in France, stating that, "In science he would not be a Frenchman, but remained an Italian. One of his great objectives was to give Italian discoveries, which the French historians had not treated fairly, their proper rank. This brought him into perpetual collision with M. Arago at the Institute, and personal enmity was the consequence." According to her, Libri was a fervent nationalist, and "Everyone who becomes acquainted with M. Libri soon learns that the restoration of Italian fame is always in his thoughts, and, though learned in the history of other sciences, his interest in collecting is that of propagandist, who would gladly, if he could, furnish every library with the means of verifying Italian History" (De Morgan 1882, 178–179).

As regards Libri's acquaintances with other political exiles, and his political guidelines, the main character among his patronages was Mazzini. As mentioned above, Libri met Mazzini in Marseille,[5] and the latter read to him his famous letter to Carlo Alberto before giving it to the press. Years later, remembering this event, Mazzini wrote:

> Before printing the letter, I read it to only one of the Italians with whom I was in contact, Guglilemo Libri, a famous scientist, leader that year of a plot against the Grand Duke of Tuscany, and accused, I think wrongly, of betrayal, but pushed, and I dislike to say that, by the materialism which was dominated his doctrine and by an exaggerated scepticism as regards all people and all things. This was like a treason of the soul's dignity and of the duties that he, a very lofty talent, must have fulfilled toward his fatherland. Libri praised but tried to dissuade me from the publication, explaining the unavoidable consequences, the perpetual exile, the renunciation of all the dearest things, the disappointments which would have been my companions in life. And he urged me to leave politics and to devote myself to history. I rebelled against the advice and I printed.[6]

In Paris, Libri shared the experience of exile with other Italian refugees, such as Vincenzo Gioberti, Terenzio Mamiani, Giuseppe Massari, Niccolò Tommaseo, Federico Confalonieri, Emanuele Dal Pozzo, Principe della Cisterna the geologist Giacinto Collegno, the *carbonaro* Guglielmo Pepe, and Francesco Orioli.[7]

[5]In 1832, after Libri's departure from Marseille, Mazzini wrote two letters to Libri that shed new light on the first publication of the issues of the "Giovane Italia"; see (Mazzini 1835).

[6]See (Mazzini s.d.: 24).

[7](Maccioni-Ruju and Mostert 1995, 96–101). On The Italian mathematicians, political refugees during the Risorgimento, see (Pepe 1998).

Throughout his time in Paris, Libri strengthened his friendship with Guizot, the main representative of the conservative party. Libri approached the moderate circles of the peninsula, predicting slow and orderly reforms for Italy. When, in 1841, Guizot became Minister of Foreign Affairs, Libri worked closely with him to create a French policy on Italian affairs. The article *De l'influence française en Italie*, published by Libri in March 1842, in the *Revue des deux Mondes*, was generally well received by the moderates, whereas Mazzini had serious objections, particularly as regards Libri's belief in the necessity of a French intervention to free Italy from the yoke of foreign domination (Maccioni and Mostert 1995, 189–191).

In a letter of March 22, 1847, to his friend Costanzo Gazzera, Libri expressed his support for the reforms carried out by Carlo Alberto of Sardinia:

> Another thing I have to say you, but in *secret* between us. My love for Italy, which will never languish in spite of my long stay in ultramontane countries, makes me look with great affection to all that is good and useful for the beautiful peninsula. My heart always rejoices when I see an Italian prince turning to the idea of peaceful and regular progress, relentless and untroubled promotion of the reforms useful for the good of the country and its subjects. I know how difficult the enterprise is made by the excessive desires of those who do not calculate obstacles, not least by the excessive fears of those who turn pale at every step taken on the path of progress, but being familiar with these serious difficulties and seeing well how things go in your country, I confess to you that I am becoming every day more an admirer of his Majesty the King of Sardinia, who preceded by several years the new Pope on the idea of reforms, and proceeds slowly but surely in the glorious enterprise. I had occasion many times to express these feelings in the *Journal des Debats* and I will not fail to applaud every new progress that at the behest of King Carlo Alberto (as I know that only he is responsible for any reform) is achieved.[8]

Libri's tepid approach to reform, proclaimed on the eve of the first war of independence, increased the distance between him and other Italian exiles and Florentine friends, with whom, in the past, he had shared revolutionary ideas with zeal. The breakup occurred first with his cousins, Guglielmo and Rosina Libri, then with Gian Pietro Vieusseux, Ubaldino Peruzzi, Marquis Torrigiani, and Luigi de Cambray-Digny. However, in contrast, the moderates Capponi, Vincenzo Gioberti, and Terenzio Mamiani supported his ideas.

2 Libri's *Histoire*, a Pioneering Work Pervaded by Patriotism and National Spirit

During his stay in Carpentras, Libri wrote the *Discorso intorno alla storia scientifica della toscana*, (Speech concerning the scientific history of Tuscany), which was published in the *Antologia*, the Florentine journal founded and managed by Vieusseux (Libri 1831). This was to be the first of a series of articles published in the *Antologia*, but in the following years, the project evolved in a different direction.

[8]Published in Italian in (Del Centina and Fiocca 2010, 124).

The *Discorso* can indeed be considered the programmatic manifesto of, and an introduction to, Libri's major work, the *Histoire des sciences mathématiques en Italie depuis la renaissance des lettres jusqu'à la fin du dix-septième siècle*, (History of Mathematics in Italy from the Renaissance of the Letters to the end of the Seventeenth Century), which was published in four volumes between 1835 and 1841 (Libri 1835; 1838–1841).

Libri's approach to the history of the sciences has been deemed pioneering. His main concept was to develop the history of mathematical sciences within the general historical context, both political and social. This new trend gained a hold among scholars, and allowed for the history of mathematics to rise to the role of an autonomous discipline. In addition, such a placement of sciences gave their history a prominent role in the construction of a National spirit, and Libri's historiographical work is imbued with it. Of course, Libri was aware of censorship, and when he wrote the *Discorso*, he always tried to avoid any possible intervention. In any case, he also sent Vieusseux variants to some passages that he thought might be cut out by the censor. In a letter to the editor, Libri wrote that he would not object to cutting a passage, or even a sentence, if this did not cause any change in the sentiment ("il sentimento"), but he insisted that not even a single word that had not been written by him should find a place in his article.[9]

The aim of the *Discorso* was to be a popular work, which could be read by the layman. So, scientific subjects were reduced to a minimum, while biographical and apologetic parts were given more emphasis. The lives of famous Tuscans, such as Cecco D'Ascoli, Dante Alighieri, Leonardo da Vinci, Niccolò Machiavelli, Galileo Galilei, and Antonio Oliva, and "the infinite misfortunes, the affronts, the hunger, the torments so generously suffered by those who worked so hard for the Glory of the native land", were underlined by Libri,[10] almost as if to mitigate his own pains as an exile through the torment suffered by the others. So, according to Libri, the history acquired value as a tool of equity, as he claimed in a famous passage, that he greatly appreciated and that it "could be considered rhetoric if not read in the context of the times" ("nel rispetto della considerazione dei tempi"): "Then history comes to gather the ashes of the Ascolian, the cloth of Galileo, and Oliva's scattered limbs, and by showing them to posterity it shouts: here the Italian awards; but do not let the harshness of the path dismay you because I succeed them".[11]

The first volume of the *Histoire des sciences mathématiques en Italie* was published in Paris in 1835 (Libri). It was composed of an *Avertissement*, the *Discours préliminaire*, nine final notes, and additions that take up half of the volume.[12] The work is dedicated "aux amis qu'il a laissés en Italie", and in the back

[9]Guglielmo Libri to Vieusseux, November 9, 1831, cit. in (Del Centina and Fiocca 2010, 201).

[10]"le infinite sciagure, gli spregi, la fame e i tormenti generosamente patiti da chi tanto faticò a Gloria della patria". (Libri, 1831, 3–4).

[11]"Ma poi viene la storia e raccoglie le ceneri dell'Ascolano, e la tovaglia di Galileo, e le membra sparte dell'Oliva, e mostrandole a' posteri grida: ecco i premi italiani; ma non vi sgomenti l'asprezza della via ché io vi succedo". *Ibidem*.

[12]The second edition of the first volume of Libri's *Histoire des sciences mathématiques en Italie* was necessitated by a fire that destroyed nearly the entire first edition, which was waiting to be

of the frontispiece, there is a phrase taken from Magalotti, “Italia lacerata, Italia mia”[13] (“Lacerated Italy, my Italy”).

In the *Avertissement*, Libri presented his approach to the history of sciences. After criticizing the method of writing about the history of sciences in which the reader travels from one star to another, from the triangle to the circle, without any reference to the men who are behind the science, he writes: “j’ai senti d’abord la nécessité de montrer que l’état intellectuel des peoples est toujours lié à leur état moral et politique; et j’ai dù m’appliquer à faire marcher de front l’histoire des idées et celle des hommes, pour les éclairer l’une par l’autre” (Libri 1835, xii).

His aim was not only scientific. He wanted to show the lives of the famous scholars, and their noble and liberal efforts for the truth at the cost of deprivation and poverty. This persevering struggle, this intellectual drama holds a great moral lesson, particularly helpful in times of discouragement. People have to be educated, but Libri warned against the danger of thinking only of the needs of the masses. The great social problem was how to improve the condition of the majority of people, but not at the expense of the individual, because eminent individuals make the glory of a nation. “Il faut reprendre la société et la rehausser tout entière. Mais l’égalité que l’on ferait en détruisant les sommités ne serait que de la barbarie” (Libri 1835, xv).

According to Libri, the action of governments could have an effect only on the mediocre mind. The frequent conflict between the education of a people and the literary glory of a nation could not be explained through the direct action of a government. It is better explained by the material requirements that influence morals and education differently at different ages: “C’est donc, à mon avis, dans les causes qui tendent à augmenter ou à diminuer la force morale des hommes, plutôt que dans celles qui font varier le nombre des écoles et des professeurs, qu’il faut chercher l’explication des phases de la gloire littéraire des nations” (Libri 1835, xvii). But a love of independence does not exclude the exercise of the noblest human ingenuity. Neither oppression nor the love of freedom must be allowed to prevent genius from developing. Therefore, in all circumstances, under all governments, eminent minds must honour their fatherland and make its name famous, because this, too, is patriotism.

Libri was particularly proud of the *Avertissement,* judged by him as “something very swift and strong” (“cosa molto rapida a forte”). Writing to his mother on November 2, 1835, he hoped that “the warm souls will be shaken by my words. And I hope that these words will do some good for the Italian people”.[14] A few days later, he wrote to her again: “Such words, at the beginning of a work so grave, should show the people that the path of injustice is vain and strewn with thorns. …

sewn and tied up. For an account of Libri’s conceptions in developing his masterly work and the vicissitudes of the work’s publication, see (Del Centina and Fiocca 2010, third part). For Libri’s scientific patriotism, see also (Durand 2018).

[13] See (Magalotti 1723, 31).

[14] “le anime generose saranno scosse dalle mie parole. E spero che queste parole faranno qualche bene agli Italiani”. Guglielmo Libri to Rosa Libri, Paris, November 2, 1835, cit. in (Del Centina and Fiocca, 2010, 217).

And think that, by writing such words, I am inspired by the memory of misfortune of so many Italian people who waited such a long time for a pen able to vindicate them."[15]

In the *Avertissement*, he did not fail to insert an autobiographical passage:

> Après de longs travaux, je m'apprêtais à publier mon ouvrage, lorsqu'un évènement imprévu vint reverser mes desseins. Forcé, en 1831, de quitter l'Italie, parce que j'avais désiré contribuer à l'affranchir du joug de l'étranger, je perdis, dans un voyage précipité, la plupart de mes manuscrits. Une tale perte, au moment où je venais d'être arraché à tout ce que l'homme a de plus cher, faillit me faire abandonner mon projet. Mais ensuite je me dis : Non il faut montrer à ces alliés des barbares qui si défendus par les censures papales, les baïonnettes étrangères et le bourreau, ils peuvent ravir la liberté, ou ôter la vie à des innocents ; s'ils peuvent arracher un ami à ses amis, un fils à sa mère, il reste sur la terre un pouvoir qui est au-dessus d'eux et qu'ils ne sauraient dompter. Il faut leur montrer que même un esprit ordinaire peut braver leurs rigueurs. Il faut leur faire prévoir que l'intelligence, principe supérieur qu'ils fortifient en le combattant, finira par les reverser. Et je recommençai mon travail.[16]

In Libri's work, the history of mathematical sciences is included as part of the general historical path. In the second volume, he found further occasion to decry despotism and underline that the true benefactors of Italy were not the men who oppressed it, as tyrants never made the glory of a nation:

> C'est la démocratie qui a tout fait en Italie ; le despotisme a voulu tout arrêter. La lutte entre ces deux principes à été longue et opiniâtre : elle recommence à chaque instant ; mais si l'on demandait à la monarchie ce qu'elle a fait de l'héritage de Fibonacci, de Marco Polo, de Dante, de Brunellesco ; comment elle a continué Colomb, Machiavel, Ferro, Léonard de Vinci, Raphaël, Michel-Ange, Ferruccio, glorieux dépôt que la démocratie lui avait confié en mourant, la monarchie ne saurait répondre qu'en montrant le Spielberg.[17]

The fourth volume of the *Histoire* is devoted to the character of Galileo, who was considered the creator of the great scientific revolution, but also a martyr to truth. Neither blindness, nor advanced age, nor the rigours of the Holy Office discouraged him from searching for the truth and stimulating his students to search for it with an irresistible ascendancy. After providing a detailed reconstruction of the most relevant events of the life of the scientist from Pisa, Libri dealt with the theme of the infamous trial.

The information concerning the events of those days in 1633 were taken from the volume *Lettere inedite di uomini illustri* (Lettere 1775) and from Giambattista Venturi's work *Memorie di Galileo* pars II (Venturi 1821).

[15]"Tali parole, in fronte ad un'opera così grave debbono mostrare agli uomini che la via dell'ingiustizia è fallace e seminata di spini." "E pensa che scrivendo quelle fiere parole io sia ispirato dalla memoria della sciagura di tanti italiani che hanno sì lungamente aspettato una penna vendicatrice". Guglielmo Libri to Rosa Libri, Paris, November 23, 1835, cit. in (Del Centina and Fiocca, 2010, 218).

[16](Libri 1835, xix). This passage was changed and mitigated in the second edition of the first volume of the *Histoire* (Libri 1838–1841, tome I).

[17](Libri 1838–1841, tome II, 284).

Libri's attention concentrated on the sentence of June 22, 1633, and on the included sentence: the judges, holding that Galileo had not revealed the entire truth as regards his mind, sentenced "d'en venir au *rigoreux examen* contre lui, et qu'il respondit *catholiquement*". The same sentence, Libri noted, was also present in an original manuscript of the Inquisition of Novara of 1705, in which the defendant was tortured. In both sentences, the torture was not mentioned, and only the sentence was reported, that is, the Catholic reply of the defendants.

In 1841, when Libri published the fourth volume of the *Histoire*, it was known that the record of Galileo's trial, which had been taken to Paris by order of Napoleon, was lost or maybe, as Libri suggested, hidden at the time of the Restoration. The astronomer Delambre, who had the opportunity to see the French translation of a portion of the documents from the record, interestingly told Venturi that the volume had been mutilated. According to Venturi, Galileo's Catholic reply to the *rigoreux examen* should have been contained within the lost part of the record. Libri, more categorically, observed that the certainty came from the Inquisition itself and from a text detailing its procedures. This was the *Arsenale sacro* by Eliseo Masini, a work well known to Libri, who owned a copy of the 1730 Roman edition (Bucciantini 2011, 353), in which torture was prescribed in cases of doubt concerning the mind ("intenzione"). Libri's conclusion is an accusation against the Church of Rome (Libri 1838–1841, tome IV, 292–294):

> La philosophie scolastique ne put jamais se relever du coup que Galilée lui avait porté : et l'Église, qui malheureusement se fit l'instrument de la haine des péripatéticiens, partagea leur défaite. Comment, en effet, oser prétendre à l'infaillibilité ; après avoir déclaré *fausse, absurde, hérétique et contraire à l'Ecriture*, une des vérités fondamentales de la philosophie naturelle, un fait incontestable et amis désormais par tout le monde ! La persécution contre Galilée fut odieuse et cruelle, plus odieuse et plus cruelle même que si l'on eût fait périr la victime dans les tourments ; car la nature humaine a les mêmes droits chez tous les individus, et il n'y a pas de privilèges en fait de souffrances physiques…. aussi, ce ne fut pas sur le corps seul de Galilée qu'on s'acharna : on voulut le frapper au moral, on lui interdit de faire des découvertes,… Cette fatale vengeance, qui pesa si longtemps sur Galilée, avait pour but de le rendre muet : elle effraya ses successeurs et retarda le progrès de la philosophie ; elle a privé l'humanité des vérités nouvelles que cet esprit sublime aurait pu découvrir. Enchainer le génie, effrayer les penseurs, arrêter le progrès de la philosophie, voilà ce que tentèrent de faire les persécuteurs de Galilée. C'est là une tache dont ils ne se laveront jamais.

Evidence of the impact that the reading of the *Histoire* had on young Italian patriots comes from Aurelio Saffi, at that time, exiled in London: "When I was young I read the history of mathematics in Italy and it affected me deeply as the monuments of the fatherland greatness remain impressed in respectful people and it helped me to understand the traditional characteristics of national thinking".[18]

[18]"Lessi, giovane ancora, la storia delle scienze matematiche in Italia, la quale fece in me quell'effetto che i monumenti della patria grandezza imprimono negli animi reverenti, e mi aiutò a intendere i caratteri tradizionali e proprii del pensiero nazionale" Aurelio Saffi to Guglielmo Libri, 28th January 1866, Firenze, Biblioteca Moreniana, Fondo Palagi Libri, filza 433, ins. 92. The letter is cited in (Bucciantini 2011, 356).

The text on Galileo from the *Histoire* was published almost in its entirety in the *Revue des deux mondes* (Libri 1841). The essay was successful. Translated into Italian, it was published in Milan in the *Annali Universali di Statistica*, but was unfortunately censored in many parts (Libri 1841a). The pages on the torture suffered by Galileo, his persecution by the Jesuits, and the long final invective against those who had perpetrated such a cruel crime were cut out.

Although a naturalized Frenchman, Libri was never perceived as such in Paris. His historiographical work was bent on claiming the merits of Italy, and this earned him an accusation of ingratitude towards the nation that had welcomed him. Bernard Julien, a member of the *Institut*, in his review of the *Histoire*, emphasized the passion and patriotic sentiment with which the work was written. However, he added that these values, though commendable, had led Libri to a lack of impartiality (Julien 1842). According to Julien, Libri had written his work influenced by the idea that Europe did not love Italy, and was hostile and jealous. In this regard, Julien quoted a passage from the *Histoire* concerning the travels of Dante and Tasso to Paris, which Libri concluded by saying:

> qu'ils ont plus donné que reçu pendant leur séjour en France, et qu'ils n'y ont pas plus appris à être grands poètes, que Léonard de Vinci à être grand peintre, ou Machiavel grand historien. A chaque nation donc ses droits et son domaine : l'Europe a beau se montrer ingrate, elle ne pourra jamais anéantir les titres de l'Italie à la reconnaissance universelle.[19]

Moreover, continued Julien, Libri claimed all the most important inventions for Italy, and in the *Histoire*, there was only room for them.

The awareness of the universality of science was well present in Libri's mind, but this stood in conflict with his main goal when he decided to write the *Histoire*, namely, to make sure the prominent role of Italy emerged within the progress of science. Libri observed that, since the sixteenth century, all European nations had cultivated science, the new philosophy had penetrated all peoples, and, for every discovery, there were several aspirants who had prepared the way for it, or had found the fundamental facts simultaneously. Hence, he concluded:

> Dans ce mouvement continuel des esprits, il n'est plus possible de suivre les progrès intellectuels d'un peuple, quel qu'il soit, sans jeter un coup-d'œil sur ce qui s'est fait chez les autres, ni d'apprécier à leur juste valeur les travaux d'un savant, sans tenir compte de ce qu'ont pu faire ailleurs ses devanciers ou ses contemporains : pour étudier avec fruit l'histoire scientifique de l'Italie, il devient donc nécessaire de s'arrêter un instant à contempler la marche de la civilisation en Occident depuis la renaissance des lettres.[20]

Libri's point of view was at the origin of several scientific controversies with French scientists on questions of priority. Major divergences arose with Arago and the mathematician and historian Michel Chasles. His relationship with Arago, initially one of good friendship, deteriorated over time to become one of great hostility. Verbal battles between the two, often originated by nationalistic claims on controversial questions regarding the history of science, took place during the

[19](Libri 1848–1841, tome II, 118).
[20](Libri 1838–1841, tome IV, 2).

meetings at the Academy, through newspaper articles, and in printed work. The figure of Galileo was one of the terrains upon which the debate was most heated, starting from the question of the discovery of solar spots, the priority of which Arago denied Galileo. Also, the biography of Galileo by Arago was judged to be in opposition to Libri's, and Arago's will to reduce Galileo as a figure was indeed seen as a desire to attack Libri (Arago 1855).

The controversy with Chasles on the origin of positional arithmetic and the originality of Leonardo Pisano's contribution developed within the confines of the Academy, and found space in their works. In regard to Pisano, nicknamed Fibonacci, the *Histoire* stated, "C'est à un marchand de Pisa, Léonard Fibonacci, que nous devons la connaissance de l'algèbre; c'est lui qui a introduit, ou au moins répandu chez les Chrétiens, le système arithmétique des Hindous" (Libri 1838–1841, tome II, 20–21). For his part, Chasles downsized the role of Fibonacci. According to him, not only was Fibonacci not the first to spread the arithmetic system of Indians in the Western World, neither was he the first author to write a work of algebra in Latin, and he further considered Fibonacci's studies of indeterminate analysis to be lacking in originality, since they derived through the Arabs from the Indians. "Nous devons regarder ce Traité [des nombres carrés] de Fibonacci comme une copie de quelque ouvrage arabe, emprunté lui-meme de ceux des Hindous", wrote Chasles (Chasles 1837, 520).

Libri reiterated that, although the decimal system was used in some ancient manuscripts, there were no rules, but only practice, and moreover, the date of such manuscripts, basically Arabic or Hebrew, was uncertain. Thus, until proved otherwise, the *Liber abbaci* remained the first work written in Latin by a "Christian", in which the rules of the new arithmetic were exhibited, and Fibonacci the first "Christian" algebraist. Libri concluded by addressing a subtle criticism to Chasles: "Quand Fibonacci dit qu'il a prix aux Arabes le système de numération des Hindous, M. Chasles veut prouver que ce système est occidental. Et lorsque le géomètre de Pisa dit qu'il a écrit sur les nombres carrés d'après des questions qui lui ont été proposées par des philosophes de la cour de Frédéric II (*Targioni, viaggi*, tom. II, p. 66), M. Chasles prétend qu'il a emprunté ses recherches aux Arabes".[21]

Libri was not always unjustly accused of partisanship. An example in which Libri's national vindication spirit took over the serene judgment of the historian was the clumsy, and veiled, attempt to consider Fibonacci as the anticipator of Viète's literal algebraic calculation, made in the second volume of the *Histoire*. According to Libri, Viète's literal notation went back to Aristotle and, adopted by the Italian algebraists, was later transmitted to the modern geometers:

> On voit ici comment les modernes ont été amenés à se servir des lettres de l'alphabet (même pour exprimer des quantités connues) longtemps avant Viète, à qui on a attribué à tort une notation qu'il faudrait peut-être faire remonter jusqu'à Aristotle, et que tant d'algébristes modernes ont employée avant le géomètre français. Car outre Léonard de Pisa,

[21](Libri 1848–1841, tome II, 303).

> Paciolo et d'autres géomètres italiens firent usage des lettres pour indiquer des quantités connues, et c'est d'eux plutôt que d'Aristote que les modernes ont appris cette notation.[22]

The question did not escape Chasles, who wanted to clarify the matter and to defend Viète's rights as the inventor of symbolic algebra. According to Chasles, mathematically speaking, it was incorrect to claim that Fibonacci made algebraic operations with symbols in the same way that they are done today; this would have meant confusing two essentially different things, the reasoning on letters and the computation on the letters:

> c'est confondre l'algèbre *numérique*, la seule cultivée par Fibonacci, avec l'algèbre *spécieuse* ou *littérale*, inventée par Viète et en usage *à présent* : grande et admirable invention, qui a changé la face des sciences mathématiques, et est devenue, par l'art des transformations algébriques, un si puissant auxiliaire de l'esprit humain.[23]

3 From London to Florence, Libri's Final year

Some of the books Libri had sent from Paris to London were sold through auctions held between 1849 and 1850, and the proceeds of the sales formed the basis of the ambitious project that led him once more to become, in just a few years, the owner of one of the largest and finest private libraries in Europe. In 1850, Libri married Mélanie Double, the daughter of his physician in Paris, who brought him a generous dowry. The legal expenses for his defence in the trial were only partly covered by his trade of books and manuscripts, and at the end of 1850, he was forced to sell, through a series of auctions, which lasted until 1864, an important portion of his precious library. In these sales, along with ancient illuminated manuscripts and very rare books, he also sold autographs by Galileo, Kepler, Leibniz, Euler, D'Alembert, Abel, Sophie Germain, and other eminent mathematicians and scientists. When Germain died in 1831, Libri came into possession of some of her manuscripts, such as her studies on Fermat's last theorem, and autographed letters, such as her correspondence with C. F. Gauss.[24]

When his wife died in 1865, Libri was deeply affected, and his already precarious health worsened. Two years later, he married Helen de La Motte, twenty years younger than he, to whom he referred several times, writing to Capponi, as "my dear angel of mercy".

In 1867, Libri's financial situation degenerated, both because his Italian revenue had been devalued as a result of the financial crisis in the young Kingdom of Italy and because of his bad investments in silver mines. Things were so bad that Libri

[22](Libri 1848–1841, tome II, 34–35).

[23](Chasles 1841, 742–743).

[24]For Sophie Germain's letters preserved in Libri's archive, see (Del Centina), and for an account of the presently known correspondence of Sophie Germain, as well as the history of its discovery and editing, see (Del Centina and Fiocca). The correspondence of Sophie Germain with Carl Friedrich Gauss has been published in (Del Centina and Fiocca 2012).

began to think of returning to Italy. In Florence, now the capital of the Kingdom, he would find a warmer climate, would be surrounded by the affections of his friends, who never forgot him, and would have enough money to live with dignity. In his homeland, Libri could also finish writing his memoirs, which he thought of as not just a story of his life, but also a history of his times: he planned to portray both Italian and French society, describing the people, explaining their politics and their customs; and, given that he had known many of the most illustrious men of his time in the fields of science, literature and politics, both in Italy and in France, he would have based his history on facts, alluding only briefly to himself within the context of stories about others. As far as we know, his project never reached fruition, and in any case, his memoirs were never published.

Libri meticulously organized the return to his hometown, as he feared the risk of extradition to France. In fact, having lost his Tuscan citizenship when he obtained French naturalization, he was not sure that he would still be an Italian citizen. Once he could be sure that he ran no risk of extradition, in 1868, Libri, helped by his friend Carlo Rusconi, began to plot his return under great secrecy. Rusconi, who had been Minister of Foreign Affairs of the Roman Republic in 1849 and, after its fall, a refugee in London, was now State Councillor in Florence. Prior to his departure, Libri shipped, via Leghorn, what remained of his library and his massive archive.

Libri left London in July 1868, and arrived in Florence only in January, after a lengthy and difficult journey to avoid crossing France. In December 1868, while still in northern Italy and in great financial difficulty for the continuation of his journey, Libri entered into negotiations with Count Giacomo Manzoni for the sale of the most important autographed documents that he still owned. Libri had met Manzoni in London in 1849, when the latter, as Minister of Finances of the Roman Republic, had traveled there in search of financial support for the Republic. Among these documents, there were: the only copy of Fermat's manuscripts by Arbogast (which were of considerable scientific value only, not being autographed originals), writings by Descartes, Euler and D'Alembert's autographed letters to Lagrange, the latter's manuscript *Sur le calcul des eclipses* and, most valuable of all, Leonardo's essay *Sul volo degli uccelli*, which had, meanwhile, been sent over from England.

In early January 1869, Manzoni went to Florence and had a quick look at the material in Libri's archive, contained in ten crates stored in the house of Senator Luigi Mannelli, a childhood friend of Libri's. Returning to his home in Lugo, Manzoni took Leonardo's codex with him. In those crates, there was also a copy of 31 documents from Galileo's trial contained in the series of registers, namely, *Decreta*, of the Archives of the Holy Office, which Manzoni had taken with him to London and left to Libri in 1849.[25]

[25]The 31 documents were communicated by Silvestro Gherardi at the *Accademia delle Scienze dell'Istituto* of Bologna in May 1869 and published one year later (Gherardi 1870). For an account of the discovery of this copy of the documents and Gherardi's edition, see (Del Centina and Fiocca 2015).

In May 1869, Libri decided to move from Florence to the hills around Fiesole, hoping that "the finer air could benefit his health". He took up residence in the Villa "Vannini", where he died on September 28, 1869.

He left his archive and what remained of his library, which he described as "my meagre inheritance", to his wife and to Marguerite Collin, daughter of his first wife Mélanie.

The dispersal of Libri's archive began immediately after his death. About half was sold by the heirs at the price of paper to a merchant, and the remaining was bought by Manzoni. Part of the first tranche was fortunately regained by Giuseppe Palagi soon after the sale, and this material is presently kept in the Biblioteca Morenia of Florence, *Fondo Palagi-Libri*, while the rest has been lost forever, with the exception of certain papers that appeared on the antique market in 1959 and 1982. Acquired by the Moreniana Library, these documents form, at present, the *Nuovo Fondo Libr*i, and *Carte Libri*.[26] From the 1940s onwards, a number of scholars, historians of mathematics in particular, have devoted a certain amount of interest to Libri's archives.[27]

The Moreniana Library, in the Palagi-Libri collection, preserves two important autographs: the manuscript of the "Parisian memoir" by the famous Norwegian mathematician Niels Henrik Abel, written in Paris in 1826 and published posthumously in 1841,[28] and the manuscript of an unpublished work by Sophie Germain on Fermat's last theorem.[29]

4 Conclusions

We have seen how Libri helped to establish a national sentiment in the era in which Italy was formed. He anticipated a theme that became central in the decade between the proclamation of the Kingdom of Italy, in 1861, and the conquest of Rome in 1871: the definition of the ethic foundation of the nation, in comparison, or, more precisely, in conflict, with the Church. The fortune of the characters of Giordano Bruno and Galileo in the second half of the nineteenth century links up with the need for such a definition (Ciliberto 2011).

In the *Histoire*, Libri dedicated many pages to expressions of sympathy, not only for Galileo, but also for Giordano Bruno, Marco Antonio de Dominis and Tommaso Campanella, who suffered cruelly for their opinions. Bruno and Dominis were victims of the court of Rome, and Campanella was a martyr to the cause of Italian Independence.

[26]For the *Nuovo Fondo Libri* and *Carte Libri*, see (Del Centina, Fiocca 2004).

[27]Worthy of mention are the research works carried out by (Candido 1941), (Brun 1955), (Procissi 1947), and (Grattan-Guinness 1984).

[28]For an account of Abel's manuscripts in the Libri collection, their history and their fate, see (Del Centina). The Abel Prize, established in 2012, on the occasion of the bicentenary of Abel, is considered the "Nobel" for mathematics; see https://www.abelprize.no.

[29]For Sophie Germain's studies on Fermat's last theorem, see (Del Centina 2008).

As regards Bruno, "un esprit supérieur… un des hommes les plus remarquables de son siècle", Libri remembered, among other things, his book *Spaccio della bestia trionfante*, in which, under the pretext of attacking paganism, he undermined the foundations of all religions, and his words before being sent to the stake "*Cette sentence vous fait peut-être plus de peur qu'à moi-même*" (Libri 1838–1841, tome IV, 143). The talent, the adventures and the ill luck of Bruno also characterized Dominis's life, who, despite issuing a retraction, also said, "bientôt, sons prétexte que sa conversion n'était pas sincère, il fut jeté dans un cachot, et il y mourut en 1624. L'inquisition ne voulant pas que la mort lui ravit sa victime tout entière, fit déterrer le cadavre de l'ancien archevêque de Spalatro et le livra publiquement aux flammes" (Libri 1838–1841, tome IV, 147–148). As regards Campanella, he was accused, along with being a magician and a heretic, of wanting to drive the Spaniards out of Italy by inciting the population and calling in the Turks for help. If this accusation appeared unfounded according to some writers, considering the way he was treated, it was difficult, according to Libri, not to consider him a martyr to Italian independence: "Cet homme de fer mérite une place dans l'histoire, parmi les philosophes, toujours peu nombreux, qui ne se sont pas bornés à dire aux autres ce qu'il fallait faire. Campanella a payé chèrement le droit d'être placé au premier rang de ceux qui ont souffert pour l'indépendance de l'Italie" (Libri 1838–1841, tome IV, 155).

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The Spread of Scientific Knowledge and Technology Transfer: André Coyne (1891–1960) and the Construction of Dams in 20th Century Portugal

Ana Cardoso de Matos

Abstract

After the World War I, hydroelectricity was definitively recognized as an energy alternative for Portugal, a country with a scarcity of coal. However, the construction of dams required not only large investments, but also very specific and up-to-date knowledge and competencies. On the one hand, this favoured the internationalization of enterprises and foreign investment, while, on the other, it determined the development of research and experimentation in laboratories equipped with state-of-the-art technology and bibliography, study trips abroad, and international collaboration among engineers. Moreover, the construction of dams in Portugal promoted the engineer's mobility and the transfer of technology, above all, when the great dams began to be constructed in the '40s. The professional trajectory of André Coyne, an engineer who had constructed dams in the "four corners of the world", is a good example of the mobility of experts, which determined his technical competencies and his international recognition.

Keywords

Engineers · Experts mobility · Dams · Hydroelectricity · Technical knowledge · Technology transfer

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1 Introduction: The Affirmation of Hydroelectricity in Portugal

Towards the end of the 19th century, hydric energy began to be seen as an alternative to the generation of electricity by thermal power. Portugal's first hydroelectric plant, located in the northern part of the country, was opened in 1898. It was a small plant that used the water flow of the River Corgo to produce electricity to light the city of Vila Real. The opening years of the 20th century saw the construction of larger hydroelectric centrals, such as the one in Serra da Estrela in 1910.[1]

World War I resulted in Portugal's dependence on coal imports affecting its economy and society in a negative way[2] and helped hydroelectricity establish itself definitively as an energy alternative. Between the two World Wars, growing interest in hydroelectricity was accompanied by the issue of legislative acts seeking to lay down rules concerning the exploitation of the country's hydric resources. In 1919, the "Lei das Águas" ("Waters Act") was published; and in 1926, the decree established the law for the exploitation of hydraulics and framed the beginning of the national power grid.[3] In 1927, the goal of "guiding and coordinating electrification works towards the construction of a national power grid" led to the creation of the *Repartição dos Serviços Elétricos na Administração Geral dos Serviços Hidráulicos* (Administrative Breakdown of Electrical Services in the General Administration of Hydraulic Services),[4] as well as the *Conselho Superior de Eletricidade* (Higher Council for Electricity).

Actual implementation of the projects, aimed at exploiting the potential of Portugal's rivers for electricity production, was hindered, however, by the atmosphere of political turmoil and economic crises that the country had to face, namely, the 1923 colonial and banking crisis and the 1929 financial crisis, the effects of which rippled on throughout the decade that followed. During the 1920s, nevertheless, dams of larger dimensions—such as the Lindoso dam—were built in the north of the country.

At the same time, both the electrification of the country and hydroelectric initiatives became central themes in discussion forums among engineers and industrialists, for example, in the Electricity Congresses held in the 1920s and '30s, in the 1932 Engineering Congress and in the Congress of Portuguese Industry held two

[1]See Rui Candeias Jacinto. "As barragens em Portugal: de finais de Oitocentos ao limiar do século XIX" in Manuel Heitor et al. (ed.). *Momentos de Inovação e Engenharia em Portugal no século XX*. Lisboa D. Quixote. 2004. vol. 2. 801–819.

[2]By the end of the war, 82.2% of electricity production in Portugal was still provided by thermal plants. Cf Ana Cardoso de Matos et al. A *electricidade em Portugal. Dos primórdios à 2ª Guerra Mundial*. Lisboa. EDP, 2005, 293.

[3]This Act has been considered the starting point of state intervention policy in the electrical sector. On October 22, 1927, the publication of Decree # 14 772 completed and specified the foundations of this Act.

[4]Decree # 26,117, from November 23rd 1935.

years later. During the latter, electro-technical engineers went so far as to defend electrification as one of the main pillars of the country's economic development.[5]

Despite all this interest in hydroelectricity, by 1928, the number of hydroelectric power plants remained low, representing only 13.7% of the total amount of private powerhouses existing in Portugal.[6]

The World War II years, by laying bare the fragility of the Portuguese economy and its dependence on imports, forced a change in economic policies and created a context that favoured the country's modernization, namely, through the creation of a national electrification plan and the development of industrialization.[7]

By then, hydroelectricity had become widely recognized as the best option for implementing an electricity network that would cover the whole country and create the conditions needed to modernize the industry and improve living standards in the main urban centres.

In 1944, the publication of Act #2002, i.e., the Law of Electrification of the Country, laid the groundwork for organizing the Portuguese electrical sector, as far as the production, transportation, and distribution of electricity were concerned. At the same time, Act #2002 established the legal framework needed for centralization and state control in that area, defining the national electrical network as «the ensemble of public structures aimed at the *production, transportation and distribution* of electrical energy»,[8] while establishing hydroelectricity as the basis for the production of electricity in Portugal. Thermal power plants were pushed back to mere backup functions, «consuming low-quality national fuel in the most economical and convenient manner» (Basis II of Act # 2002). As a consequence, deactivation of thermal plants was foreseen in those places where the supply of electrical energy would be guaranteed by hydric plants.

To overcome private entrepreneurs' lack of capital, the State guaranteed financial support to those electricity-producing companies whose efforts fell within the scope of the future electrification plan, although it was established that private capital would have to constitute the bulk of investment. In exceptional cases, and in the name of public interest, the expenses related to the installation of the plants could be totally assumed by the State.

After the publication of Act #2002, the government promoted the creation of the companies *Hidroelétrica do Zêzere* (Hydroelectric of Zêzere) and *Hidroelétrica do Cávado* (Hydroelectric of Cávado). These were created in October 1945, and in

[5]The conclusions drawn by the Congress clearly illustrated the need to develop the electrical sector and use national resources for energy production. On those conclusions, see João Tamagnini de Sousa Barbosa. *1º Congresso da Indústria Nacional. Relatório Final*. Lisboa: AIP, 1933, p. 17.

[6]Cf, Ana Cardoso de Matos et ali. *A electricidade em Portugal: dos primórdios à 2ª Guerra Mundial*. Lisboa. Ed. FEDP. 2004. 230.

[7]On this subject, see Maria Fernanda Rollo. *Portugal e a Reconstrução Económica do Pós-Guerra. O Plano Marshall e a economia portuguesa dos anos 50*. Lisboa. Instituto Diplomático. 2007. 40–41.

[8]Jaime Alberto do Couto Ferreira, João José Monteiro Figueira. *A electrificação do sector de Portugal no século vinte*. Lisboa. EDP Distribuição-Energia. 2001. 24–25.

both cases, the State provided a third of the capital, while another third was assigned to big producers and distributors already operating in this sector.

On December 27, 1945, *Hidroelétrica do Zêzere* was granted the concession to exploit the energy from the waters of the River Zêzere, in the section extending from Cambas to the confluence with the River Tagus, involving the construction of four plants: those at Cabril, Bouçã, Castelo de Bode and Constância. Preliminary work for building the Castelo de Bode dam—assumed as a priority—began almost immediately, with technical missions from England coming over to Portugal to study the ground. Actual construction, however, only started in 1947, and was concluded in 1950. The dam was inaugurated on January 21, 1951.

That same year, *Hidroelétrica do Cavado* was also given the concession to exploit hydric energy, in their case, in the Cávado and Rabagão Rivers. In the former, dams were conceived for the locations of Paradela, Lavandeiras and Caniçada, while the River Rabagão was to receive the Venda Nova dam.

The scale of the works, and the technical knowledge demanded by the construction of the Castelo de Bode and Venda Nova dams, constituted «a significant leap forward, both qualitative and quantitative, compared to everything that had been achieved up to then in the hydroelectricity sector».[9]

2 Building the Great Dams: Financing, Technical Knowledge, and Monitoring

The hydraulic initiatives of the 1940s and beyond made it necessary to undertake great civil works, possible only thanks to support from the Marshall Plan and the national *Planos de Fomento* ("Development Plans"). The new technical challenges posed by these works required, in their initial stages, the collaboration of foreign experts, and, in subsequent stages, the development of national engineering and the support of research and experimentation in regard to structures.

Cooperation between the *Direção Geral dos Serviços Hidráulicos e Elétricos* (General Board of Hydraulic and Electrical Services) and the *Centro de Estudos de Engenharia Civil* (Centre for Civil Engineering Studies)—belonging to the *Instituto Superior Técnico*-IST (Technical Institute)—was essential in building the great dams. This centre was created in 1941, thanks to the initiative of the engineer Manuel Rocha, who, in his capacity as professor of Strength of Materials at IST, initiated the experimental teaching of this discipline. After graduating from IST as an engineer in 1938, achieving the top grades in his course, Manuel Rocha spent two years, 1938–39, at the Massachusetts Institute of Technology, with a scholarship granted by the Institute for Higher Culture. By 1945, he was at the *École Polytechnique Fédérale* (Federal Polytechnic School) in Zurich. In 1947, he became one of the founders of the International Union of Laboratories and Experts in Construction Materials,

[9]Luís Lucena Ferreira. *A produção de electricidade na segunda metade do século XX e a engenharia nacional*. Manuel Heitor et ali. *Momentos de inovação e engenharia em Portugal*. Lisboa. D. Quixote, 2004, vol II, 729.

Systems and Structures, and he was an active affiliate of the International Commission on Large Dams (ICOLD), created in 1928, and the International Society for Rock Mechanics (ISRM). His stays abroad, along with his participation in international institutions, enabled him to remain updated on technical progress while facilitating his entry into an expert network in the field of great dam construction.

Under Rocha's guidance, research and experimentation at IST's *Centro de Estudos de Engenharia Civil* saw significant development. Nevertheless, in order to advance the study of civil engineering subjects such as the strength of materials, it became necessary to create an institution with a different dimension, as well as gather larger technical and financial resources. As a consequence, on November 19, 1946, the *Laboratório Nacional de Engenharia Civil* (LNEC) (National Civil Engineering Laboratory) saw the light of day. It absorbed the aforementioned *Centro de Estudos de Engenharia Civil*, as well as the *Laboratório de Ensaio e Estudo de Materiais* (Laboratory for Trial and Study of Materials) belonging to the Ministry of Public Works.

In the years that followed, LNEC provided important support to the study of dams in general.[10] Under Rocha's direction, the Department of Dam Scale Models was created. It was run by the engineers Joaquim Laginha Serafim, who became a member of ICOLD in 1948,[11] and António da Silveira.[12]

Given the sheer scale of the hydroelectric works being planned, in 1946, the Comissão de *Fiscalização das Obras dos Grandes Aproveitamentos Hidroelétricos* (Supervision Committee of the Works of Large Hydroelectric Plants) was created.[13] This commission, comprising two civil engineers who specialized in hydraulic works and an electro-technical engineer appointed by the Ministry of Economy, was tasked with carrying out the technical oversight of the plant construction works and presiding over the proper execution of the specifications laid out in the concessions, as far as electricity-producing centrals were concerned.

In the medium-to-long term, hydroelectric initiatives contributed to promoting the creation of national companies working on consultancy and civil construction in the field of dams. Such was the case with the enterprise *Moniz da Maia, Duarte & Vaz Guedes, Lda*, founded in 1947 and specialized in dam construction. Their first dam was built in Castelo de Bode. On the other hand, those initiatives favoured the development of the Portuguese metalworking industry—of which SOREFAME was an example—and of the national electrical industry—as was the case with EFACEC.[14]

[10]See Ana Cardoso de Matos. «As paisagens da hidroelectricidade em Portugal: um exemplo das paisagens de inovação técnica» in Pedro Fidalgo. *Estudos da Paisagem*. Lisboa. Ed. IHC-FCSH-UNL. 2017. vol.1. 60–62.

[11]From 1988 to 1991, he was Vice-President of ICOLD. He was also a member of a number of technical committees, like the Sub-Committee on Dam Safety Regulations.

[12]The engineer António da Silveira was also a founding member of COBA, Consultores de Barragens e Aproveitamentos Hidráulicos, Lda., created in 1962.

[13]Decree # 35,684 June 3rd.

[14]Luís Lucena Ferreira. *A produção de electricidade na segunda metade do século XX e a engenharia nacional* in Manuel Heitor et al. (cord), *Momentos de inovação e engenharia em Portugal*. Lisboa. D. Quixote. 2004. Vol. II. 731.

3 The Construction of Dams: Supranational Knowledge and Expertise

As for other areas, the technological knowledge needed to construct dams, namely, those of a hydroelectric nature, was always supranational in nature, because it was constantly disseminated and updated through different agents and means. We can mention the following[15]: technical treaties, specialized journals, in particular, those of engineering associations; professional associations and societies, namely, those of engineers; civil engineering schools, especially those existing in countries where this branch of knowledge was more developed and where foreign students regularly completed their studies, as was the case, for example, with the *École Centrale* or the *École des Ponts et Chaussée*s, in Paris, France, which allowed for the creation of a supranational engineers' network[16]; and, finally, the existence of societies for study and engineering consultancy firms.

The existence of an Association of Portuguese Civil Engineers (renamed *Ordem dos Engenheiros* (Order of Engineers) in 1936), the offer of training and internships abroad to Portuguese engineers, as exemplified by Manuel Rocha in the USA and Belgium, participation in major international institutions, and network links that were established and maintained with peers from other countries all favoured the circulation of knowledge in engineering and the transfer of technology, enabling Portuguese engineers to follow the progress made in the field of dam construction.

Despite all of this, the scarcity of civil engineers needed to construct dams compelled Portugal to attract the expertise of their foreign colleagues. At times, however, the different geomorphological conditions of the country made it necessary to adapt technologies to new natural contexts. Since the exchange of knowledge and experience was very important for improving the technology used in this kind of large public works, the year 1928 saw the aforementioned creation of the International Commission on Large Dams (ICOLD). Its first Congress was held in Stockholm in 1933, the second in Washington in 1936, and the third, in 1948, saw a return to Stockholm. Regular congresses sponsored by this Commission still exist to the present day. The Commission published the «Bulletins Téchniques» with recommendations that, according to Jean Louis Bordes, constituted «un exemple remarquable d'échange technologique et de capitalisation de l'expérience» ('a remarkable example of technological exchange and leverage of experience').[17]

The construction of dams also required the mobilization of technical knowledge related to engineering (hydrography, geography and geology, strength of materials, mathematical calculus, etc.). As Jean-Louis Bordes says:

[15]Jean-Louis Bordes. « Les barrages en France du XVIIIe à la fin du XXe siècle. Histoire, évolution technique et transmission du savoir». *Pour Memóire*. nº 9. 2010. 106–110.

[16]Konstantinos Chatzis, Dmitri Gouzévitch, Irina Gouzévitch. « Betancourt et l'Europe des ingenieurs de 'Ponts et chausées ?: des histoires connectees». *Quaderns d'història de l'enginyeria*. 2009. vol. 10. 9.

[17]Jean-Louis Bordes. «Les barrages en France du XVIIIe à la fin du XXe siècle. Histoire, évolution technique et transmission du savoir». *Pour mémoire*, *Revue du comité d'histoire du ministère de l'Ecologie et du Développement durable*. nº 9. 2010.110.

> Hydropower is an area of use for most of the industrial knowledge of an era. This activity involves, on the one hand, a very large part of practices and capacities related to civil engineering, metal, mechanical and electrical construction, to automatisms and to applied hydraulics. On the other hand, and this is one of its great peculiarities, hydroelectricity appeals to the natural sciences, to hydrology, to river hydraulics, to geology, and to the mechanics of the soil.[18]

The construction of dams also required large amounts of capital, and some of the foreign enterprises that invested in Portuguese constructions also provided the transfer of technology.

4 The Construction of Dams in Portugal (1907–1940): Engineer Mobility, Foreign Investment, and Technology Transfer

The construction of the Lindoso dam in 1907 is an example of the important role that foreign companies and engineers played in the construction of Portuguese dams.[19] The interest in exploring the possibility of a power station in the River Lima in 1905 arose from a project elaborated by Jesus Palacios Ramilo, a native of Rivadavia, and Justino Antunes, born in Guimarães. Having obtained permission to use the waterfall on the River Lima in 1908, they transferred it to the engineer Eugenio Grasset Echevarría (1868–1960), who, in May 1908, created the company *Electra del Lima* in Madrid to build the power station.[20]

In 1897, Echevarría had already created the company *Grasset y Compañia*, and even after acquiring the concession for Lindoso, he continued to work for other companies. Thus, in 1909, he worked for the electric company Hidrola in the construction of the Molinar tunnel, and in 1911, he became a Spanish distributor for the Swiss company Brown Boveri. Three years later, he joined Oskar Busch, the representative of Brown Boveri in Spain, to create the *Sociedad Española de Electricidad Brown Boveri*, to which were assigned the manufacture, sale and management of electrical equipment. By 1930, this engineer was involved in three important electricity generation firms: the *Compañia Salto del Cortijo* (Salto del Cortijo Company), the *Companhia Transportes Eléctricos* (Electric Transportation

[18]«L'hydroélectricité constitue un lieu d'utilisation de la plupart des connaissances industrielles d'une époque. Cette activité fait appel d'une part à une très grande partie des pratiques et capacités relatives au génie civil, à la construction métallique, mécanique et électrique, aux automatismes, à l'hydraulique, appliquée. D'autre part et ceci est une de ces grandes particularités dans le monde industriel, l'hydroélectricité fait appel aux sciences de la nature qui sont l'hydrologie, hydraulique des rivières, la géologie et l'hydrogéologie, la mécanique des sols», Jean Louis Bordes. « Génie civile et hydroelectricity» in Jean-Louis Bordes, Annie Champion, Pascal Desabres (dir). *L'Ingénieurs entrepreneurs. Les centraliens et l'industrie*. Paris. PUB. 2011. 173.

[19]This power plant no longer exists: it was brought down following the construction of the Alto do Lindoso Dam, inaugurated in 1992.

[20]On this company, see Isabel Bartolomé. "Un holding a escala ibérica. Electra del Lima y el Grup Hidroeléctrico (1908–1944)". *Revista de História Industrial*. nº39. 2009.119–151.

Company) and the *Compañía Productora de Fuerzas Motrices* (Motor Force Production Company), in Bilbao.

Work at the Lindoso power station[21] began in 1908, but, due to both World War I and technical difficulties, including delays in the importation of machinery from the United States, construction was halted, despite the large number of workers involved (500–1000 workers, at the time of the war).

At that moment, Juan Urrutia y Zulueta (1866–1925), an electrical engineer who had received his training at the *Escuela de Minas de Madrid*, became interested in the Lindoso power station, so, in 1916, he travelled to Portugal to visit the company *Electra del Lima* and study its financial capacities. He had already had some experience in enterprises created to explore hydroelectricity: in 1901, he had created, in Bilbao, the enterprise *Hidroeléctrica Ibérica*, with Eduardo Aznar and José Orueta, for which he held the position of director. He was also one of the founders of the Spanish Hydroelectric and a promoter of the *Electra del Viesgo*.

After examining the conditions of the power station and assuring himself that his investment in Electra del Lima would be profitable, he acquired 87.3% of the company, using financial support from the Viscaya Bank.

Work was concluded on April 2, 1921, with the installation of Escher Wyss generators from General Electric, with a power of 8750 kVA. The hydroelectric power station was inaugurated in 1922.

5 André Coyne and the Construction of Large Dams in Portugal: An Exemplary Case of Expert Mobility

Among the engineers who came to Portugal to conceive and direct the construction of dams was the Frenchman André Coyne (1891–1960),[22] who had an important role in conceiving and building the dams of Santa Luzia, Castelo de Bode, Venda Nova and Salamonde.

5.1 The Trajectory of an Expert in Dam Construction

In 1910, André Coyne entered the *École Polytechnique* de Paris and, after concluding his training there, continued his studies at the *École des Ponts et Chaussées*. In 1920, he entered the sea service in Brest, where he worked with Eugene

[21]On the power station of Lindoso, see Maria da Luz Sampaio. "A central termoeléctrica do freixo: um projecto da UEP – união eléctrica portuguesa, para o fornecimento de energia à região do porto (1922–1958)" in Miriam H. Zaar, P. Junior, Magno Vasconcelos, Horacio Capel (Ed.). *La electricidad y el territorio. Historia y futuro*. Barcelona: Universidad de Barcelona/Geocrítica, 2017 http://www.ub.edu/geocrit/Electr-y-territorio/Electr-y-territorio-Portada.htm.

[22]Daniel Bevelay. "André Coyne e os projectos de Castelo de Bode e Venda Nova" in *EDP, O passado, o presente e o futuro dos grandes aproveitamentos hidroeléctricos*, Lisboa, EDP. 2001. 21–27. André Coyne built 70 dams in 14 different countries.

Freyssinet (1879–1962) on the Albert-Louppe bridge, also known as the Plougastel bridge, which was built between 1926 and 1930. The foundations of this bridge were designed "as shells" by Coyne, who also directed the works, since he had "the necessary experience to use these shells for the construction of dams, of which he became the best designer in the world."[23] Coyne considered Eugene Freyssinet as one of his masters,[24] and in his contact with him, he refined "a scientific empiricism imbued with circumscription vis-à-vis mathematical deduction."[25]

In 1928, he was appointed to direct the Haute Dordogne planning department, guiding the works in Haute Dordogne for the exploitation of the hydraulic resources of the Massif Central. There, he built the Marèges dam, finished in 1935.

During the construction of this dam, Coyne rethought the whole problem of the project, stressing the importance of flood control, which led him to move the dam from its original position.[26] The same year, the *Service technique des grands barrage*s (STGB) (Technical Service of Large Dams) was formed, organized with the collaboration of André Coyne. This service was charged with constituting and updating a record with all the technical documentation pertaining to subjects concerning the great dams.[27] Coyne remained at the head of the *Service spécial d'aménagement de la haute Dordogne* (Special planning service of the Haute Dordogne), linked to STGB.

All in all, Coyne was the designer of over fifty-five arch dams. Some of them were located in Dordogne, as was the case with Marèges (1935), Saint Stephen Cantales (1945), and the Eagle (1947), but he also conceived and built dams in other places, such as Morocco, Chile, Tunisia and Zimbabwe. In this last country, he built the the Zambezi River's Kariba dam, which was the last dam designed by André Coyne.

In 1947, benefitting from the contribution of a younger engineer, Jean Bellier (1905- 1986), André Coyne set up the Office of Studies André Coyne and Jean Bellier (A.C.J.B.).[28]

This Office was characterised in this way:

> Being a strong component of the corporate culture, the quest for technical excellence through exchange, innovation and development has been constantly pursued by a very stable management team, chosen among the company's engineers. The practice of the

[23]David Fernandez-Ordonez. "Eugène Freyssinet, 'I was born a 'builder'" in Manfred Curbach (dir). *Actes du congres. Dresdener Brückenbausysmposium*. Dresde. Allemagne. Institut für Massivbau, Technische Universität Dresden. 2018. 113.

[24]Jean-Louis Bordes, Bernard Tardieu. «André Coyne, de la Dordogne au Zambèze, la passion de construire». *Bulletin de la Sabix,* 56. 2015. 13. URL: http://journals.openedition.org/sabix/1452 (accessed 20 mars 2020).

[25]Bernard Marrey. « Coyne (André) (1891–1960)» in Antoine Picon (ed). *L'Art de l'ingénieur. Constructeur,: entrepreneur, inventeur*. Paris. Ed Centre Georges Pompidou. 1997. 141.

[26]Jean Louis Bordes. « Barrages et essais en vrai grandeur: auscultation et surveillance». *Documents pour l'histoire des techniques*. nº 20. 2011. 101.

[27]On this subject, see Jean-Louis Bordes and Bernard Tardieu. « André Coyne, de la Dordogne au Zambèze, la passion de construire». *Bulletin de la Sabix*. 56. 2015. 23. URL: http://journals.openedition.org/sabix/1452 (accessed 20 mars 2020).

[28]In 1962, A.C.J.B. changed its name to *Coyne et Bellier. Bureau d'Ingénieurs- Conseils.*

> experimental method integrating computation has been particularly developed. Some techniques such as pre-stressing in dams or tunnels have opened other fields of activity such as nuclear enclosures and tunnels and cavities. Overcoming geopolitical constraints, commercial practices have tried, through dialogue, exchange and technology transfer, to encourage customer loyalty.[29]

Coyne was also the inventor of “acoustic monitoring procedures”, the device for which proved very useful in dam building, and, in 1947, he founded Télémac - Télémesures Acoustiques, SARL (Télémac—Accoustic Telemetrics, SARL) in order to manufacture this device, known as a *témoin sonore/corde vibrante*,[30] and offer assistance in its installation and operation.

After his death in 1960, the *Revue Le Génie Civil* published an article stating that “the art of construction loses in the person of André Coyne an eminent engineer, who renovated the design of dams—these works which are so important for the current energy technology.”[31]

Six years later, the *Association Professionnelle des Ingénieurs de Ponts et Chaussées et des Mines* published a tribute in its bulletin, mentioning “the expert’s prestigious qualities: intelligence, imagination, courage, energy, love of the profession, high sense of responsibility. His inventive spirit, his intuition of men and things, his profound sense of construction, coupled with an outstanding artistic spirit, turned the works by this great engineer into technical and aesthetic successes.”[32]

[29]“Composante forte de la culture d’entreprise, la recherche de l’excellence technique par l’échange, l’innovation et le développement a été constamment poursuivie par une équipe dirigeante très stable, issue des ingénieurs de la société. La pratique de la méthode expérimentale intégrant le calcul a été particulièrement développé. Certaines techniques comme la précontrainte dans les barrages ou les tunnels ont ouvert d’autres champs d’activités comme les enceintes nucléaires et les tunnels et cavités. Au-delà des données géopolitiques, les pratiques commerciales ont essayé, par le dialogue, l’échange et le transfert technologique, de favoriser la fidélisation des clients.». Jean-Louis Bordes, Jean-Pierre Herriou. « Entre excellence technique et recherche de marchés: Coyne et Bellier, 1947–2009». *Entreprises et histoire*. vol. 71. Nº. 2. 2013. 62–82.

[30]Jean-Louis Bordes. « Barrages et essais en vraie grandeur: auscultation et surveillance». *Documents pour l’histoire des techniques*. 2011. 101. URL: http://journals.openedition.org/dht/1739 (accessed 30 mars 2020).

[31]« « L’Art de la construction perd dans la personne d’André Coyne un ingénieur éminente, qui a rénové La conception des barres, ouvrages si importants pour la technique actuelle de l’énergie». “Nécrologie de André Coyne”. *Le Génie Civil. Revue générale des industries françaises et étrangères*. Nº 3529, 1e décembre 1960. 508.

[32]« prestigieuses qualités du technicien: intelligence, imagination, courage, énergie, amour du métier, haut sentiment des responsabilités. Son esprit d'invention et d'intuition des hommes et des choses, son sens profond de la construction mêlée à un sens artistique exceptionnel, ont fait des ouvrages de ce très grand Ingénieur des réussites techniques et esthétiques». « Hommage à André Coyne (1891–1960)». *Bulletin du PCM. Association professionnelle des ingénieurs ponts et chaussées et des mines*. 63e Année. Octobre 1966. 11–12.

5.2 Coyne, an Engineer "in the Four Corners of the World"

The development of dam building and the creation of specialized services for the design and control of the construction of the major dams—the STGB—were accompanied by a search for information on similar achievements in industrialized countries (the USA, Italy, Switzerland). Thus, being aware of how important it was to exchange knowledge and experiences with those engineers who, in other countries, also dedicated themselves to dam construction, André Coyne completed a series of missions abroad: in 1929, he went to Switzerland and Italy, visiting the latter again in the following year; in 1933, he went to Spain, in 1934, to the USA, in 1937, to Egypt, and in 1938, to England, as well as taking a trip to Portugal and several more to Italy before 1939.

One of his destinations was, as stated above, the United States of America. This country not only had a large number of dams, but, in 1922, had also initiated a great programme of study and experimentation on arch dams, so as to better understand their mechanical behaviour, reduce construction costs and improve safety. Also in the USA, in 1925, Roy Carlson (1900–1990) designed a device to measure pressure in concrete structures.[33] Coyne's trip, originally scheduled for 1928, had to be postponed due to the huge amount of work on his hands: it did not end up materialising until 1934.[34] We do not know exactly which places Coyne visited, but it is very likely that he visited M.I.T.—the same institution that later provided an internship for the Portuguese engineer Manuel Rocha, the director of IST, whom we previously mentioned. In all probability, the name of André Coyne was still in the air when Rocha became an intern in the institution. This fact, plus a possible encounter between the two men at the ICOLD congresses (the 1933 and 1939 editions of which Coyne was the rapporteur, becoming its president from 1946 to 1951), in addition to the papers published by Coyne in Engineering journals, must all have contributed to his being called when Portugal initiated the construction of large dams.

From 1937 onwards, Coyne joined the group of experts consulted by the Egyptian government on the construction of the Aswan dam. Starting in 1942, he intervened in the conception and construction of several dams in Portugal, their works extending to the year 1953. In 1947, already counting on the intervention of A.C.J.B and the technical support of Béllier, he worked in Tunisia, designing the Nebeur dam in the Mellégue *oued* for the company *Chaufour Dumez et Ballot*. The same year, his activity extended to Morocco, where he designed the Morocco Bine El Quidane. In 1957, he planned the project for the Rappel dam in Chile which, due to financial problems, only saw its construction start in 1963. In 1959, he designed the Kariba dam in Zimbabwe. Meanwhile, in 1954, he was asked "to review plans

[33]Jean-Louis Bordes. « Barrages et essais en vraie grandeur: auscultation et surveillance». Dossier thématique: L'expérimentation "en plein air" ou "grandeur nature": Une pratique scientifique au service de l'action (XIXe-XXe siècles). *Documents pour l'histoire des techniques*. 20. 2011, 99 and 100.

[34]Jean-Louis Bordes, Bernard Tardieu. « André Coyne, de la Dordogne au Zambèze, la passion de construire». *Bulletin de la Sabix*. 56. 2015.18.

drawn up by the Inter-Territorial Power Commission (Southern and Northern Rhodesia."[35]

In the ensuing decades, Coyne and his enterprise designed several other dams, scattered all over the world. As mentioned by Jean-Louis Bordes, the expansion of his and his company's work "leaned, for the most part, on the personal influence of André Coyne, vice-president of the International Commission on Large Dams in 1936, and then its 2-term president (1946–1952), but on French enterprises as well."[36]

5.3 Coyne and the Construction of Large Dams in Portugal

The first project completed by André Coyne in Portugal was the Dam of Santa Luzia, on the Unhais River (a tributary of the Zêzere). It was concluded in 1942, and was the first arch dam ever built in the country. According to Eng. Laginha Serafim, the building process created "a deep interest in the systematic analysis of the problems posed by the construction of large dams."[37] The building of this dam also marked the beginning of the collaboration between DGSH and the Centre for Civil Engineering Studies at IST, where Manuel Rocha led a programme of experimental and analytical studies, focusing on the sizing of arch dams.[38] In these studies, they followed the pioneering experiments conducted at the Bureau of Reclamation in the USA, with models of the Hoover dam on the Colorado River.[39]

The development and utilization of trial methods on physical models in the lab were an essential element of the research on arch dams carried out at the IST Centre. The Santa Luzia dam, boasting a 70-m high vault, had been tested via physical models, and that process was the subject of "Model Trials for the Santa Luzia Dam," a paper presented by Manuel Rocha and Laginha Serafim at the 3rd ICOLD Congress, held in Stockholm in 1948.[40]

[35]Kate B. Showers. "Electrifying Africa: An Environmental History with Policy Implications". *Geografiska Annaler*. Series B, Human Geography. Vol. 93. No. 3. September 2011. 199.

[36]Jean-Louis Bordes, Bernard Tardieu. « André Coyne, de la Dordogne au Zambèze, la passion de construire». *Bulletin de la Sabix*. 56, 2015. 32–33.

[37]Laginha Serafim. As grandes Barragens dos Aproveitamentos Hidráulicos Portugueses. Memoria nº187. Lisboa. Laboratório de Engenharia Civil. 1962. 7, quoted by Rui Candeias Jacinto. "As barragens em Portugal: de finais de Oitocentos ao limiar do século XXI". Manuel Heitor et al. (ed.). *Momentos de Inovação e Engenharia em Portugal no século XX,* Lisboa. D. Quixote, 2004. vol 2. 809.

[38]Rui Candeias Jacinto. "As barragens em Portugal: de finais de Oitocentos ao limiar do século XXI". Manuel Heitor et al. (ed.). *Momentos de Inovação e Engenharia em Portugal no século XX*. Lisboa. D. Quixote. 2004. Vol. 2. 809.

[39]Tiago Saraiva e Maria Paula Diogo. "O Estado Novo dos engenheiros: Instituto Superior Técnico e Laboratório Nacional de Engenharia Civil" in Tiago Saraiva e Marta Macedo (org). *Capital Científica. Praticas da Ciência em Lisboa e a História Contemporânea de Portugal*. Lisboa. ICS. 2019. 316.

[40]José Vieira de Lemos, Luís Lamas (org) *Contribuição de Manuel Rocha para a mecânica das rochas e as fundações de barragens*. Lisboa, LNEC. 2013. 21 and 14.

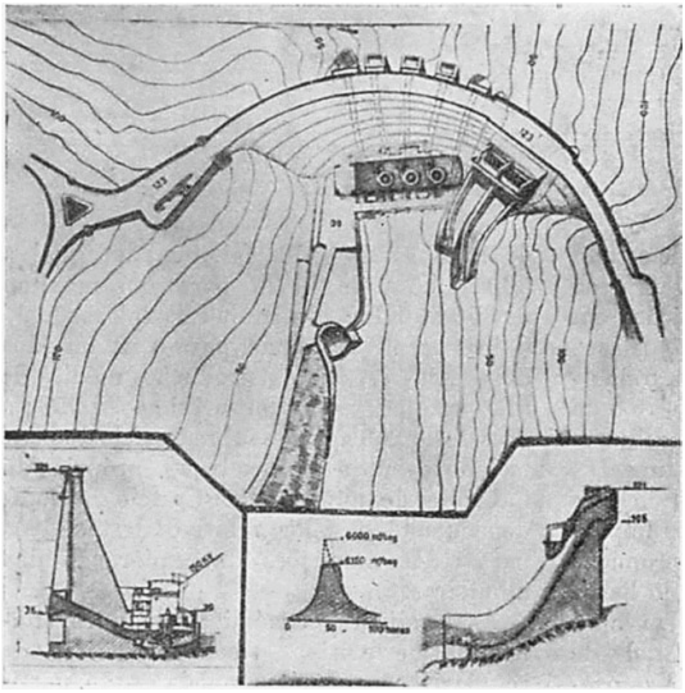

Fig. 1 Castelo de Bode Dam. Plans for the works. *Source* Tecnica, 1952, N221, p. 400

André Coyne also designed and constructed the dam at Castelo de Bode. To approach this large venture, a hydrological study was conducted in 1939–1940 by the Portuguese engineer Zuzarte Mendonça (1877–1967), director of the *Repartição de Estudos de Hidráulica* (Services of Hydraulic Studies), while the geological study was carried out by the French geologist Maurice Gignoux (1881–1955),[41] whose knowledge in the field of geology was internationally recognized.

The year 1943 saw the conclusion of the project implemented by DGSH (*Direção Geral dos Serviços Hidráulicos*); a decision was made, however, to "hear from a highly qualified expert," and so DGSH commissioned Coyne to draw up a new project. This was the one that, with modifications, "came to serve as the basis for the concession granted in 1945."[42]

The construction of the Castelo de Bode dam was adjudicated in 1946 to the company *Moniz da Maia & Vaz Guedes*,[43] which undertook the works in charge. André Coyne closely monitored the construction works—which included raising a

[41]As early as 1941, Maurice Gignoux, an expert in geology applied to dams from the Faculté de Sciences de Grenoble, had visited Portugal to assess the feasibility of a dam project for Castelo de Bode.

[42]Diário das Sessões da Assembleia Nacional. V Legislatura. nº81. session March 9th. 1951. 527.

[43]This enterprise later became the public works company Somague, which still exists in Portugal.

115-m-high arch—until their conclusion. A young engineer from his team lived in Lisbon for five years, to ensure constant oversight of the ongoing work. The dam was inaugurated in 1951.

It was the Office of Studies André Coyne and Jean Bellier (A.C.J.B.) that, in 1953, made the first underground hydroelectric plant—the Salamonde Dam, constructed in Portugal (Fig. 1). The turbines and alternators installed were Brown Boveri equipment. For this reason, in 1954, the magazine *Brown Boveri* published an article about this dam, illustrating the whole process of operation with explanatory drawings (Fig. 2).

In the 1950s, dam construction definitely contributed to the affirmation of hydropower. In these works, the role of Portuguese engineers was enhanced, which contributed to the affirmation of Portuguese engineering in this area. It also confirmed the role played by the National Laboratory of Civil Engineering (LNEC), as an indispensable means of support for these great works.

6 Conclusion

The complexification of the great public works—of which dam construction was a major example—required very specific and up-to-date knowledge and competencies, in addition to large investments. On the one hand, this favoured the internationalization of enterprises and foreign investment, while, on the other, it determined the development of research and experimentation in laboratories equipped with state-of-the-art technology and research, study trips abroad, and international collaboration among engineers.

Illustrating the first statement, we saw how, in the opening decades of the 20th century, Spanish entrepreneurs became interested in investing in Portugal for the purpose of building dams in the northern part of the country. As for the second aspect, we saw that building large dams made it necessary to coordinate efforts at an international level, and led to the creation of institutions such as ICOLD, which brought together engineers working on dams throughout different countries, who, in the congresses organized by this institution, had the opportunity to exchange ideas and experiences and to develop collaborations.

Some engineers stood out thanks to their studies and to the dams they designed and built, becoming internationally recognized experts—a case in point was the Frenchman André Coyne. In the beginning, the need to stay updated regarding the latest studies on dams led him to go on several missions abroad; at a later stage, his international reputation gave him the chance to provide advice and construct dams in countries as diverse and far apart as Morocco, Chile, and Portugal. And, according to Jean-Louis Bordes, working abroad provided Coyne with "the opportunity for a fruitful collaboration with foreign engineers, some of whom

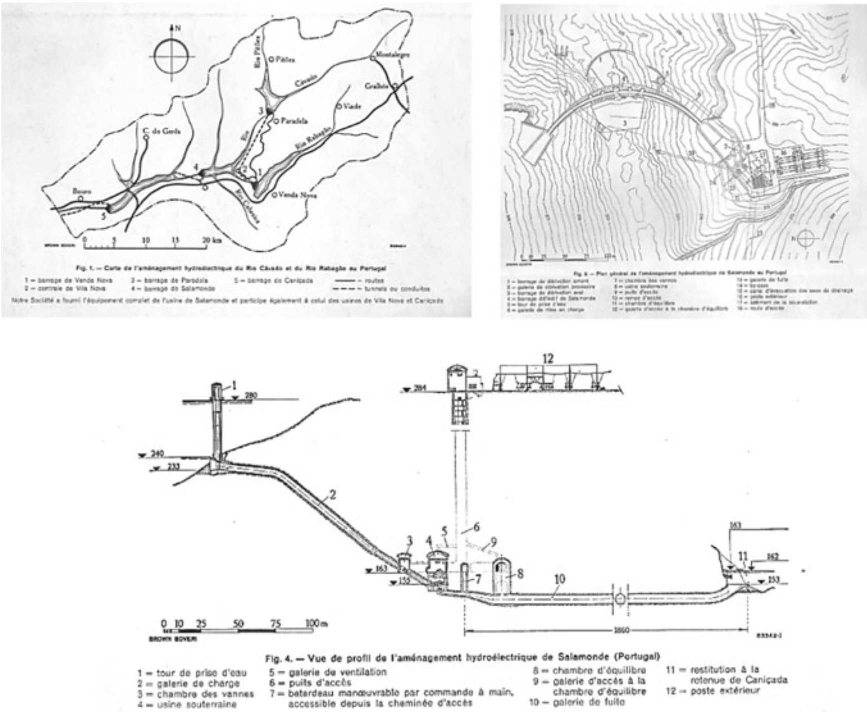

Fig. 2 Drawings for the Hydroelectric Power Plant of Salamonde. Source: «L'usine hydroélectrique de Salamonde au Portugal» in Brown Boveri magazine, vol. 10 nº 54 1954 pp. 1–8. Private archive

became internationally reputed experts, including Laginha Serafim and Manuel Rocha in Portugal."[44]

Thus, André Coyne's professional trajectory exemplifies the mobility of experts, determined, in his case, by his technical competencies and his international recognition.

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[44] Jean-Louis Bordes, Bernard Tardieu. «André Coyne, de la Dordogne au Zambèze, la passion de construire». *Bulletin de la Sabix*. 56. 2015. 33.

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On the Emigration of Russian Mathematicians During the Revolutionary and Post-revolutionary Events of the 1910s and '20s

S. S. Demidov

Abstract

The Great October Revolution of 1917 in Russia and the ensuing civil war caused a large flow of emigration, a significant part of which, if not quantitatively, then qualitatively, belonged to the Russian intellectual elite. Within this flow, a significant group was formed by scientists, including mathematicians. These were scientists from the capitals of St. Petersburg and Moscow, as well as from other university centers in the European part of the country. They settled in the universities of France, Yugoslavia, Czechoslovakia, the USA, Great Britain and other countries. And although, among them, we can quote a number of brilliant mathematicians, such as, for example, A.S. Besikovitch, V.A. Kostitzin and Y.V. Uspensky, their departure did not affect the development of mathematics in the country—as the leading mathematicians remained at home and the scientific potential that had accumulated by that time determined the successful development of the Soviet mathematical school, which became one of the leading world mathematical schools of the second half of the 20th century.

Keywords

Russian mathematicians · Soviet universities · Emigration of Russian mathematicians · Revolutionary and Post-revolutionary period · Years 1910s and '20s · Emigration versus resilience · The Post-war Russian Mathematical School

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1 Introduction

The meaning of the term “emigration” is extensive. For example, in the Soviet literature of the 1960s, the term “internal emigration” was widely used to mean a passive confrontation with the state system caused by rejection of official ideology and the impossibility of expressing this disagreement openly. However, it is not our intention to discuss here either emigration in general or the aforementioned “internal emigration”, but rather to focus on the phenomenon of the abandonment of a country (in this case, Russia) caused by the events of the 1917 revolutions, which took place towards the end of the First World War (1914–1918) and the subsequent fratricidal civil war of 1917–1922. The flow of this emigration, mainly to the countries of central and western Europe, but also to the United States, was both large and extremely diverse in its social composition. Those who fled did not want to live in a new society constructed by the Bolsheviks—the Marxist fundamentalists of the day—and, moreover, they belonged to the most diverse social strata of society, ranging from former ministers of the government of His Imperial Majesty to simple peasants, with different doctrines and faiths (mainly Orthodox). Although scientists did not constitute one of the largest groups, they were quite representative, one might say the crème de la crème of Russian society of that time, and among them were some mathematicians, who will form the subject of this essay.[1]

In order to understand the phenomenon under examination, we must start with the following important general remark. The dramatic events that triggered the flow of emigration were rather unevenly distributed across the vast extent of the Empire and, of course, were not uniform over time. In some cases, they were violent and fierce, in others, they proceeded relatively calmly. Some dissenters managed to “lie low”, while others were washed away in the muddy streams of history and forced to flee. In addition, learned people were unevenly distributed across the map of the Russian Empire: the scientists were mostly grouped around the centers of university life—Petersburg, Moscow, Kazan, Kharkov, Yur’ev (formerly Dorpat and now Tartu), Kiev, Warsaw, and Odessa. All of these centers were located in the European part of the Empire. The “self-determination” of the new states that sprang up on its borderlands at that time – primarily in Poland and the Baltic lands – causes some terminological confusion. For example, how to classify Anton Pavlovich Psheborsky (A.-B. Przeborski, 1871–1942), who was born in Ukraine to the family of an officer of the Russian army and graduated from Kiev University? Most of his life was devoted to Kharkov University. In 1919, he was elected to the position of rector of this university. He was literally forced to leave Kharkov in 1922 because of the political situation in Ukraine—in 1920, he was even accused of espionage and spent some time under arrest. In Poland, after a short stay in Vilno (now Vilnius—the

[1]In recent years, the topic regarding the emigration of Russian mathematicians in the period under review has been studied by many researchers. Among them, I would like to quote N.S. Ermolaeva, whose papers I will repeatedly refer to in this article, as well as an article by L. Mazliak and Th. Perfettini (Mazliak L., Perfettini Th., 2019), whose data on the emigration of Russian mathematicians to France will be used in our article.

capital of Lithuania, which, by the will of fate, found itself within the boundaries of Poland at the time), he settled in Warsaw, where he worked at the university until the end of his life (the Polish university is not to be confused with the Russian Warsaw University evacuated to Rostov-on-Don—this will be explained further on). During the his time in Kharkov, Psheborsky's life was characterized by a very wide range of interests in mathematics (in his bibliography, we can see works on algebra, differential equations, differential geometry, and calculus of variations), whereas, in Warsaw, he focused on problems regarding theoretical mechanics (Ermolaeva, 1997g; Wachulka, 1976). Similarly, how can we classify a young teacher at Kharkov University, Yu.Ch. Neuman (Cz. Splawa-Neyman, 1894–1981), who, in 1920, also fell into the clutches of the "valiant" Chekists and spent about two weeks in prison? In 1921, he managed to secure permission to move to Poland. After working for several years in Poland and the UK, in 1938, he (J. Neyman) settled in the United States, where he launched an extremely successful career in the field of mathematical statistics. It is worthy of note that, in 1963, he was elected as a member of the US National Academy of Sciences and, in 1979, a foreign member of the Royal Society (Kendall, Bartlett and Page, 1984; Klonecki, 1995). Within which category can we collocate Psheborsky and Neuman? Emigrants or repatriates "returning to their historical homeland", especially since their departure to Poland was carried out in accordance with the program of repatriation after the Polish-Soviet War of 1920? The last two examples refer to mathematicians working in southern Russia, where the civil war unfolded with particular cruelty and unpredictability. A good place to start is with the capital cities, St. Petersburg and Moscow, as they determined the climate in the life of the Empire and, in particular, in the scientific and university milieu.

2 Emigration from the Capital Cities

Mathematical life in St. Petersburg was, above all, determined by the activities of the mathematicians belonging to the mathematical class of the St. Petersburg Imperial Academy of Sciences.[2] The Academicians, according to the charter of the Academy, had to live and work in St. Petersburg. In this city, at this point in time, the world-famous Petersburg Mathematical School, also known as the Chebyshev School after its creator (Yushkevich, 1968; Delone, 2005), was at the height of its success. P.L. Chebyshev (1821–1894) spearheaded the main directions of its research: the probability theory (A.A. Markov, A.M. Lyapunov, Ya.V. Uspenskii), the constructive function theory (A.A. Markov, V.A. Markov), the stability theory (A.M. Lyapunov), the theory of differential equations and mathematical physics (A. M. Lyapunov, V.A. Steklov, A.N. Krylov, N.M. Gyunter), and the number theory

[2]The presence of this institution explains the turmoil around the St. Petersburg Mathematical Society, which appeared and then disappeared. Its functions as a unifying center for the mathematical life of the city were embraced by the mathematical class of the Academy. The first attempt to create a society occurred in 1890, and it existed until 1897. It was revived again in 1921 and existed until 1930. The present society was established in 1959 (Yushkevich, 1968).

(A.N. Korkin, E.I. Zolotarëv, G.F. Voronoi, A.A. Markov, Ya.V. Uspensky). The school, above all, based its research on the possibilities of its application, i.e., the right to exist was recognized only for those mathematical theories that could obviously be applied. An exception was made only for number theory, which had been the traditional field for St. Petersburg since the time of L. Euler. They justified their inclusion of the theory of numbers by considering it to be a forge of methods widely used in applications! According to the representatives of this school, the methods adopted were expected to be rigorous and effective, that is, they had to bring the solution either to the exact numerical answer or to an approximate solution with the ability to evaluate the accuracy of the approximation. They considered any "philosophy" to be nonsense, especially if this philosophy had any contact with religion. The ideological position of the leaders of the Petersburg mathematicians of that time can be defined as positivistic. In the mathematical community, even now, there is an anecdote (I heard it from A.P. Yushkevich), which, however, may well be true.

In 1900, at the St. Petersburg Academy of Sciences, the famous German historian of mathematics, Moritz Cantor, was elected as a foreign corresponding member. This election may seem somewhat surprising, because the history of mathematics was not held in high regard among the St. Petersburg mathematical community. According to the anecdote, this event can be explained as follows: It was, in fact, Georg Cantor, the famous proponent of set theory, who had been proposed for nomination, which meant that, among the Petersburgers, there existed a "disobedient" member who was an admirer of the great mathematician and his ideas. However, when the electoral process reached its final step, and community leaders (Markov and company) saw the name "Cantor" on the ballot, they realized that the election of Georg Cantor, with his philosophical and religious rubbish, could prove to be of irreparable damage to them (after all, if someone had proposed his name, others could potentially vote for him)—so they took it upon themselves to make a change that would be more acceptable to them: they entered the initial "M" in front of "Cantor", corresponding to "Moritz". The respected historian of mathematics would be better than this "theologian‵! It may just have been a joke, but, in a wonderful way, it revealed the true state of the climate that reigned in the mathematical milieu.

The Petersburgers evaluated the Muscovites, or rather, the activity of the Moscow philosophical mathematical school, in more or less the same way (Nekrasov, 1904; Demidov, Ford, 2005; Demidov, 2007, 2009).

In fact, even if the proof of applications also occupied an important place in the studies of the Muscovites—we may recall the works of N.E. Zhukovsky and his students (S.A. Chaplygin and others) in the field of mechanics—at the same time, the Muscovites never lost sight of the philosophical implications of their activities (Nekrasov, 1904; Demidov, Ford, 2005; Demidov, 2007, 2009). They opposed positivism, and their philosophical studies (above all, the works of N.V. Bugaev) even influenced the development of Russian religious and philosophical thought (P. A. Florensky, A.F. Losev) (Demidov, Ford, 2005; Demidov, 2007, 2009). Such a position, of course, did not go unnoticed by their Petersburg colleagues, who underestimated the achievements of the Muscovites in applied mathematics and regarded their results in the field of differential geometry with a sort of apathy, as they considered them to be without any practical benefit. A real war unfolded among the mathematicians of the two capitals, causing heated discussions at the meetings of the Moscow Mathematical Society, which were reported in the pages of the "Mathematical Sbornik" (Demidov, 2007, 2009). This divergence of opinion may also be seen in the question of emigration. While a noticeable group of the prominent mathematicians left St. Petersburg for the West, only one abandoned Moscow.

The St. Petersburg mathematical community scarcely survived the events of the revolutions and the ensuing civil war. In 1918, A.M. Lyapunov committed suicide, in 1922, A.A. Markov died, followed by V.A. Steklov in 1926. The number of academicians in the mathematical class of the Academy of Sciences was reduced to two—i.e., A.N. Krylov and Ya.V. Uspensky (1883–1947). Moreover, the latter left for a business trip to the United States[3] in 1929 and never returned to his homeland; in 1930, he sent his letter of resignation to the USSR Academy of Sciences. From 1929 until his death, he worked as a professor at Stanford, where he created an entire school of disciples (Markov and others, 1921; Ermolaeva, 1997k). He became the most eminent Russian mathematician among the emigrants.

In 1922, using the repatriation program that had been utilized by Psheborsky and Neuman following the Polish-Soviet War of 1920, V.A. Steklov's student, Ya.A. Shokhat (J.A. Shohat, 1866–1944) (Ermolaeva, 1997l), who had recently defended his master's thesis, received permission to travel to Poland. However, after a brief sojourn, he settled in the USA, where he eventually worked as a professor at the Pennsylvania university. He successfully developed Chebyshev's theory of orthogonal polynomials, and, in 1934, published a book on the same topic in Paris in a famous series of monographs by E. Borel. His other book, "The Problem of Moments", co-written with Ya.D. Tamarkin (we will be referring to him again later on), inaugurated the new series of "Mathematical Surveys" of the American Mathematical Society.

In 1924, two young mathematicians, Ya.D. Tamarkin (J.D. Tamarkin, 1888–1945) and A.S. Bezikovich (A.S. Besikovitch, 1891–1970) emigrated to the West. The former, whose results in the field of his teacher, V.A. Steklov, attracted the attention of his colleagues, was highly praised for his teaching at the Institute of Railways and the Electrical and Polytechnic institutes, as well as at Perm University in 1919–1920; he was, moreover, a successful author of high school textbooks.[4]

[3]The first time Uspensky visited the United States was in 1924, immediately after the International Congress in Toronto. In 1926, he was invited to the USA to give lectures for two years. In 1927, he married a US citizen. During his last trip, in 1929, he received information about the worsening political situation in his homeland through P.L. Kapitsa, and was advised by A.N. Krylov to abandon any hope of returning.

[4]His closest friend in those years was another student of Steklov's who later became famous for the concept of an expanding universe, namely, A.A. Friedman. Some information on their youthful years may be found in the book (Tropp, Chernin and Frenkel, 1988).

The latter, a disciple of A.A. Markov, was also a gifted mathematician and teacher. In the fall of 1924, Bezikovich obtained the Rockefeller scholarship.[5] However, the Soviet authorities would not give him permission to travel. Bezikovich and Tamarkin both decided to flee. Bezikovich fled through Finland, reaching Copenhagen, where he spent the whole year working with H. Bohr on questions regarding the theory of almost periodic functions. He later went on to work with G. Hardy at Oxford, after which he gave lectures in Liverpool for a year. In 1927, he moved to Cambridge, where he remained for the rest of his life. His results on the almost periodic functions, the theory of measure and integral, as well as on other questions of the theory of functions, contributed to his renown. In 1934, he was elected to the Royal Society and, in 1952, he was awarded the Sylvester Medal[6] (Burkill, 1971; Taylor, 1975; Ermolaeva, 1997a).

Contrastingly, Tamarkin, having crossed the border with Latvia,[7] went directly to the USA, where his career followed a very successful path, first as a teacher at Dartmouth College, and then, from 1927, as a professor at Brown University; from 1942–1943, he served as vice president of the American Mathematical Society, and created a major scientific school. He was, moreover, the author of a large number of works on various issues of analytical and applied mathematics, and he was ultimately elected to the American Academy of Arts and Sciences (Hille, 1947; Ermolaeva, 1996, 1997j; Tolsted, 1996).

If these three Petrograd mathematicians had gone abroad of their own accord, the same cannot be said about the honored professor of Petrograd University, D.F. Selivanov (D.F. Selivanoff; 1855–1932). A disciple of P.L. Chebyshev, he worked in the field of algebra. His manuals and, in particular, a book on the calculus of finite differences, published in German in 1904 (Russian edition published in 1908), enjoyed widespread popularity. An extensive review of the theory of finite differences, published in the German "Encyklopädie der Mathematischen Wissenschaften", remains well known. In August 1922, for no apparent reason, he was arrested by the Cheka, spent more than a month in prison and, on November 16, as part of a large group of opposition-minded intelligentsia, which included many famous philosophers, like N.O. Lossky and L.P. Karsavin, was deported from the country on one of the famous "philosophical steamboats" (Chamberlain, 2007). Until the end of his life, he lived in Prague, where, by the request of the Russian

[5]In those years, the famous physicist P. Ehrenfest lived in Petrograd and was well acquainted with Bezikovich's results. He drew H. Bohr's, G. Hardy's and J. Littlewood's attention to his results, and they all supported the young mathematician.

[6]The administrative talents of Bezikovich (Dean of the Physics and Mathematics Faculty, organizer and Dean of the Workers' Faculty and, finally, rector of the university) were discovered during the period of his work at Perm University (1917–1920).

[7]The following anecdote about Tamarkin is still circulating within the mathematical community. After wandering through the forests on the border of the USSR and Latvia, Tamarkin appeared at the British consulate in Riga. Exhausted and shabbily dressed, he did not give the impression of being a professor from Petrograd University, as he claimed to be. Wanting to verify the truth of his words, the British consul, who had attended lectures in mathematics at the college and still retained some knowledge of mathematical literacy, asked him to calculate the integral of x^2. The professor passed the test with honor, thus giving ample proof of his identity.

Academic College, he held lectures for Russian students, among others (Ermolaeva, 1997i; Saltykov, 1932; Rothe, 1934). In 1930, a Czech translation of his book on the calculus of finite differences was published.

Three promising young Petrograd mathematicians and one of their chiefs, academician Uspensky, may therefore be said to have voluntarily chosen emigration and successfully continued their work abroad. Their choice was certainly encouraged by the general atmosphere that prevailed in the northern capital, in which a trend towards western culture played a significant role. It was a completely different picture in Moscow. Among the Moscow mathematicians who became well-known at the time of emigration, only one left, and he may be considered a special case. We refer to V.A. Kostitsyn, who was not an opponent of the Soviet regime; on the contrary, he was one of its guides.

A student of D.F. Egorov, V.A. Kostitsyn (V.A. Kostitzin, 1883–1963) was a gifted mathematician. During his student years, he joined the revolutionaries. In 1905, he became a member of the Russian Social Democratic Party, and, as a Bolshevik, he was an active participant in the December uprising in Moscow. He led a squad of students at Moscow University in revolutionary battles on Presnya and miraculously avoided execution. It comes as no surprise, therefore, that he was imprisoned in 1907 in the legendary St. Petersburg Crosses, where he spent a year and a half; after his release, he immediately emigrated, first to Vienna and then to Paris. At that time, he became close friends with V.I. Lenin and his wife N.K. Krupskaya. In Paris, he graduated from the Sorbonne and was actively engaged in mathematics. He published articles on systems of orthogonal functions in the "Mathematical Sbornik" and the Parisian "Comptes Rendus". In 1916, he returned to Russia and was conscripted into the army. He participated in the February Revolution of 1917 and in the subsequent revolutionary events. Finally, he became Deputy Commissar of the Southwestern Front. In the spring of 1918, he returned to science, the topic of his research being astrophysics. Although, by the beginning of the war, he had already separated himself from the Leninists and was no longer a member of the party, his Marxist convictions and acquaintances with the Bolshevik leaders led him to become involved in the organization and management of science and education i.e., on the State Academic Council, in the collegium of the department of popular-science literature of the State Publishing House, and on the board of the department of scientific literature of the People's Commissariat of Education. He was also in charge of the State Technical Publishing House. Through all of these positions, he actively contributed to the development of the study of physical and mathematical sciences at Moscow University. He organized the research institutes of astrophysics and geophysics, as well as mathematics and mechanics, at Moscow University. Moreover, he became the director of the geophysical institute, the chief of the department of the astrophysical institute, and also scientific secretary of the institute of mathematics and mechanics. We can confidently say that it is improbable that, without the help of Kostitsyn, D.F. Egorov would have been able to create one of the best European mathematical institutes of that epoch. Without Kostitsyn, it would not have been possible to restore the publication of "Mathematical Sbornik", raising it to the level of one of the leading mathematical journals in Europe. During these years, his research focused on mathematical problems regarding astronomy and geophysics. Among his achievements of this period, we may recall the mathematical model of the Kursk magnetic anomaly. His collaboration with V.I. Vernadsky was fruitful. In 1926, he was appointed as the head of the scientific department of the Glavnauka of the People's Commissariat of Education, which controlled all of the country’s scientific institutions. Thus, he became one of the most influential scientific administrators in the USSR. However, Kostitsyn disagreed with the changes occurring in the political climate in Moscow in the late 1920s and, when he left for another professional trip in 1928, he never returned, an act that got him labelled as a defector.

In Paris, he successfully worked mainly on problems of mathematical biology, becoming one of the founders of this new field (see (Kostitzin, 1935, 1937; Mazliak and Perfettini, 2019)).[8] Until his death in 1963, he remained a citizen of the USSR (including the period of the Nazi occupation of Paris: in 1941–42, he was imprisoned in a German camp in Compiegne), and at the end of his life, he transferred his manuscripts (including the diaries and memoirs, which were being published in Moscow (Kostitzin, 2017)) to the Soviet Embassy in Paris (Ermolaeva, 1997e). A person with such political views (the “Soviet patriot” in exile) must have been viewed as a black sheep within the Parisian emigrant circles.

Among the Muscovites who emigrated to the West was Ervand Georgievich Kogbetliyev (Ervand Kevorkovich Kogbetlyants) (E.G. Kogbetliantz, 1888–1974). A native of Nakhichevan-on-Don (nowadays, the Rostov-on-Don district), he graduated from Moscow University in 1912 and, under the supervision of D.F. Egorov, he “prepared” his “professorship”. Having successfully passed his master's exams, in 1915, he became a privat-docent of the university.[9] His research focused on the theory of trigonometric series. In 1917, when life in Moscow was becoming difficult, he left, first for Ekaterinodar, and then to Armenia, where, in 1920, he became a professor at the new Yerevan University. He ultimately settled in Paris, in 1921. In 1923, he defended his thesis at the University of Paris (supervisor: E. Borel). In the early ‘30 s, he began to engage in geophysics. From 1933–1939, he worked as a professor at the Superior Normal School (subsequently transformed into a University) in Tehran, and then returned to Paris, where he was unsuccessful in finding a job. During the German occupation, he ended up in the USA, where, from 1946–1953, he worked at Columbia University in New York. He was a consultant in geophysics at Standard Oil, and was involved in programming. In 1968, he retired and returned to France (Mazliak and Perfettini, 2019; Ermolaeva,

[8] I would tentatively suggest that one of the reasons that Kostitsyn emigrated was his remarkable set of ideas (primarily in mathematical biology), which required development—it suffices to look at the list of works on mathematical methods of biology that he published in the 1930s, including 4 monographs published between 1934 and 37. The storms that were gathering in Moscow constituted a serious threat to the implementation of his scientific plans (he had excellent sources of information and was able to make a reliable assessment of the situation). He found himself faced with a choice, which he duly made.

[9] Information about his teaching activities can be found in (Petrova, 2007).

1997d). He died in 1974.[10] Moscow was never a center of attraction for Kogbetliev. Apparently, he departed with no regrets and maintained no trace of his having belonged to the Muscovites. The only prominent (in fact, outstanding) Muscovite who emigrated to the West was, therefore, V.A. Kostitsyn.

Young Moscow mathematicians in the 1920s and early 1930s spent a lot of time in the West, mainly in France and Germany, but always returned home. The Moscow cultural environment held on to its pupils tightly.

3 Emigration from the Russian Province

Because of the approaching German army, the western-most university of pre-revolutionary Russia, Warsaw University, was evacuated to the east in 1914 and settled in Rostov-on-Don, which had agreed to host it. Leading university mathematicians also moved there. Later, Yuryev (formerly Derpt) University was to follow suit, as, in 1918, it was evacuated to Voronezh. When Estonia became an independent state in 1920, a Tartu peace treaty between Estonia and the RSFSR was signed. According to this agreement, the former Yuryev, now named Tartu University, along with its property and teaching staff, was obliged to return to Estonia. However, most of the Russian university employees chose to stay in Voronezh, continuing to work at the University of Voronezh, organized in 1918 on the basis of the previous Yuryev University. One exception was the well-known mathematician and rector of the pre-war university V.G. Alekseev (Aleksejev V.G.; 1866–1943), who did not stay in Soviet Russia—he had left Voronezh earlier in 1919, together with the White Army, which, during the Civil War, had captured the city for several months. In an independent Estonian state, he could no longer remain the rector, and thus was initially a privat-docent, and then a university professor. A graduate of Moscow University and one of the most prominent representatives of the Moscow Philosophical and Mathematical School, he worked for most of his creative life at Yuryev University as a professor, Dean of the Faculty of Physics and Mathematics, and Rector. Is he to be considered an emigrant? In his homeland Russia, beginning in 1919, he had been considered as such. According to the Internet, he died in 1943, but the reliability of this information has not been verified. Alekseev's main accomplishments are related to algebraic geometry, invariant theory, and the history and philosophy of mathematics (Kostin, Sapronov and Udodenko, 2003). His findings concerning the applications of the theory of invariants in chemistry were widely known.

World War I and the revolutionary events of 1917 that erupted during its course, as well as the subsequent bloody civil war, weighed down by the intervention of Germany, Austria-Hungary, Great Britain, the United States and other countries, had a strong impact on the lives of the inhabitants in the southwest of the Empire.

[10]This was announced by L. Mazlyak in his communication on September 13, 2019, at the First Conference of the International Academy of the History of Science in Athens.

University life in Kharkov, Kiev, and Odessa was often completely paralyzed. The successive regimes—whether red, white, any kind of hetman and ataman, or ultimately, the occupation authorities—plunged science and education into a difficult situation. It could certainly have been expected that this would lead to significant emigration, and indeed it did.

Psheborsky and Neuman's departure from Kharkov has been dealt with, but no discussion on emigration would be complete without mentioning A.M. Lyapunov's and V.A. Steklov's student N.N. Saltykov (N. Saltykov, 1872–1961). A specialist in the theory of differential equations and theoretical mechanics, he was nominated as a professor at Kharkov University. In 1919, he followed the White army, left the city and moved to Tiflis (now Tbilisi) and began to teach at the university and the Polytechnic Institute. In 1921, after the arrival of the Bolsheviks, he left Georgia and moved to Belgrade, where he became a professor at the University of Belgrade. Beginning in 1946, he became a researcher at the newly founded Mathematical Institute of the Serbian Academy of Sciences and Arts. In 1934, he was elected its corresponding member, and, in 1946, became a full member. His findings on the theory of first-order partial differential equations and on the history of mathematics are widely known. His role in the development of mathematical research in Yugoslavia is significant, as he trained several generations of students (Ermolaeva, 1997h).

Another Russian mathematician whose contribution to the development of mathematics and mathematical education in Yugoslavia cannot be overestimated is A.D. Bilimovich (A. Bilimovich, 1879–1970). In 1903, after attending the lectures at St. Vladimir University in Kiev, he remained at the university "to prepare for a professorship." After defending his master's thesis in analytical mechanics in 1912 and taking an internship in Paris and Göttingen, he was appointed, in 1914, as a professor at the Department of Applied Mathematics at Novorossiysk University in Odessa. There, he continued his research in the field of analytical mechanics, presented his doctorate and, in 1918, was elected rector of the university. At the beginning of 1920, when the Red Army was approaching the city, Bilimovich left Odessa and emigrated to Serbia. His entire future life was connected to the University of Belgrade, where, for many years, he headed the Mathematical Institute. He became the creator of the Yugoslav school of theoretical mechanics. His merits were recognized through his election as a corresponding member in 1925 and as a full member of the Serbian Academy of Sciences and Arts in 1936 (Ermolaeva, 1997b; Rikun, 2014).

Owing to the ethno-cultural and religious affinities of the peoples of these two countries at that time, Serbia gave shelter to many emigrants from Russia. Another point of attraction for the Russians was Czechoslovakia, as we mentioned earlier in the case of Selivanov, who settled in Prague in 1922. In the same year, a citizen of Odessa, E.L. Bunitsky (E. Bunicky, 1874–1952) emigrated there. After his graduation from Novorossiysk University (1896), he went about "preparing for a professorship." In 1906–1907, he undertook a professional trip to Göttingen and, on his return, continued his scientific and pedagogical activities. In 1913, he defended his master's and later his doctoral dissertations on the theory of differential equations. In 1913, he became a docent and, in 1918, an ordinary professor at Novorossiysk University in Odessa. In 1922, he emigrated to Prague, where he took part in the organization and the activities of the Russian Free University. From 1931, he began teaching at Charles University as a professor. He was engaged in various questions of mathematics, but his main interests lay in the field of analysis (Ermolaeva, 1997c).

In 1922, a mathematician from Kharkov, N.E. Podtyagin (N. Podtjagin, 1887–1970), also went to Prague. A graduate of Kharkov University (1910), he remained at the school "to prepare for the professorship." After an internship in Paris (1912–1914), he worked at Kharkov University and the Polytechnic Institute, subsequently emigrating, in 1921, first to Constantinople and then to Prague, where he worked at Charles University and continued his research on the growth of functions. In 1926, he published the monograph "Theory of the growth of functions" in Russian. In the '30 s, he changed his research to the field of probability theory and financial mathematics. In 1938, he defended his doctoral dissertation on this topic at Charles University. In 1939, he moved to Bratislava, where he worked in the mathematics department of the pension institute and at the Higher Technical School (Ermolaeva, 1997f).

My story ends with a special case: the history of the world famous mathematician A.M. Ostrovsky (A. Ostrowski, 1893–1986), who left the country before the war, in 1912. Gifted with an amazing mathematical talent that was discovered while he was at school, his teacher took him to a seminar by D.A. Grave, a professor at Kiev University. That a 15-year-old boy should be introduced to the circle of Grave's students was indeed a most unusual event. Since he was not studying at the gymnasium, but rather at a commercial school, his qualification did not ensure his entrance to university. Grave tried hard to procure an exception for this talented young man. However, the head of the educational district refused to accept Grave's demand. This decision may have resulted from his Jewish roots. Subsequently, on Grave's advice and letter of recommendation to E. Landau in Göttingen and K. Hensel in Marburg, Ostrovsky went to Marburg. Shortly after this, the war began, and Ostrovsky moved to F. Klein in Göttingen. There, he set about preparing for the publication of his collected works. The proclamation of the 1917 revolution and the subsequent changes forced Ostrovsky to abandon the idea of his return. Further events from the famous mathematician's biography can easily be found in the extensive literature devoted to him, but one important fact is that he never visited his homeland again.[11]

4 Concluding Remarks

As we have seen, the events of the 1917 revolutions and the ensuing civil war obliged a considerable number of mathematicians to emigrate. Some of them were already established and were at the height of their talents, others were beginners

[11]He enjoyed being with his compatriots, and often showed his hospitality by inviting them to his house in the town of Montagnola on Lake Lugano. On one occasion, he took A.P. Yushkevich to see a part of his house—an underground vault with a large stock of canned food, which the owner regularly replenished. This "collection" testified to the fear of a future nuclear war, which was common among Europeans in the '60 s, fueled by the memory of the recent famine from the previous terrible war.

whose talents had just begun to unfold and who would later reach the peak of their scientific careers abroad.[12] However, this emigration had no fatal consequences for the development of mathematics in the USSR, firstly, because the vast majority of leading mathematicians remained at home, and secondly, because the creative potential of Russian mathematics that had developed by 1914 was so great that only a catastrophe, like a government fueled by anti-scientific policy, could have annihilated it. Thankfully, this was not the case, as the ruling Bolsheviks, with their Marxist ideology, viewed science from a specifically Marxist perspective, treating it as a kind of sacred cow. Therefore, and this is the third reason, the development of science and scientific education in the new Russia was given special importance, and if, on the one hand, Marxism did a disservice to the development of the social sciences by ensuring their one-sided development, on the other, it did not represent an impediment to the development of the natural sciences, the physical and mathematical sciences in particular. This comparatively prosperous development was facilitated by the approach of World War II—a powerful military industry was needed, the construction of which would have been impossible without the development of physical and mathematical sciences in the 20th century. As a result, as early as the '30 s, construction had begun on the Soviet mathematical school, which, in the second half of the twentieth century, was second to none in the world.

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[12]Of course, the list of emigrating mathematicians herein presented is not complete. Absent, for example, are the names of S.E. Savich (1864–1946) and V. Bernshtein (1900–1936), upon whom Mazliak reports in (Mazliak and Perfettini, 2019). They were excluded because Savich, a specialist in actuarial mathematics, emigrated to France at the age of 55 and did not conduct any active scientific work in France, while Bernshtein's scientific activity became developed in France, where, in 1930, he defended his thesis on the Dirichlet series (supervisor: P. Montel) and then in Italy from 1931–1936, where he obtained citizenship and taught mathematical analysis at the University of Milan.

There are names that appeared, for example, in reviews of Moscow university teaching, but then disappeared from our sight. Some were swallowed up by the civil war, as happened, for example, with A.A. Volkov, whose tragic fate (arrested and executed in 1919 as part of the case of the "White Guard National Center") was recently revealed (Petrova, 2018). The fate of others remains unknown to us, like the figure of M.I. Kovalevsky, who appeared as a graduate of the gymnasium in a letter from D.F. Egorov to D. Hilbert in 1906 (Egorov, 1985) and later appeared as a privat-docent of Moscow University in teaching reviews for 1916–1918 (Petrova, 2017). With a reasonable degree of certainty, none of the emigrant mathematicians who, at the time of their departure, had successfully given expression to their results, has been forgotten.

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Exile's Experts. Some Considerations on the Activity of the Russian Academic Group in Paris

Laurent Mazliak and Thomas Perfettini

Abstract

The "Groupe Académique Russe à Paris", among many other associations, was established by the Russian community during the interwar period. It has played a notable role in the continuity of the community's intellectual and academic life by creating Russian sections at Sorbonne University and offering scholarships. In this chapter, we will present why and how this association occupied such an important position by focusing, in particular, on the path of a few Russian mathematicians who emigrated to Paris during this period.

Keywords

Russian emigration · Groupe Académique Russe · League of Nations · High Commission for Refugees · Evgueni Vassilevitch Anitchkoff · Jenö Kollarits

1 Introduction

On November 18, 1920, the *Journal Officiel* (Official Journal of the French Republic) announced the creation of the *Groupe Académique Russe* (Russian Academic Group—RAG below), a non-profit association dedicated to "*bringing Russian and French Russian academics together*".[1] Several organizations of this type had recently been created, reflecting the on-going structuring in Paris of the life of Russian exiles.

After 1985, *Perestroika*, followed by the dissolution of the USSR in 1990, raised a wave of interest in the history of emigrants from Russia who had fled the Bolshevik regime after 1917. This interest was particularly fueled by the discovery in Russia

[1] Journal Officiel de la République française, November 18, 1920, p. 18597.

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of a flood of unknown archives that had become accessible after decades of neglect. Some studies were also carried out in other countries, no more so than in France, where the Russian emigration had been particularly significant: for example, a broad panorama of the Russian emigration to France is offered by Hélène Menegaldo in (Menegaldo, 1998) and by Catherine Gousseff in an important series of works on the subject. (Gousseff, 2008) certainly represents the most complete picture of the Russian emigration to France available today. These studies offer a reliable perspective on a phenomenon that, in the past, has been the subject of numerous legends. This is the case, for example, when the question of the size of this emigration is at stake. As (Gousseff, 2008, p. 9) writes, a reliable figure for the number of Russian refugees in France is around 75,000, no doubt an important figure, but far from the 400,000 (or more) refugees sometimes mentioned in the past. Various works carried out in France also focused on specific subgroups: in particular, the Armenians, who were divided between the Russian and Ottoman empires and whose emigration was the consequence both of the policy of extermination of the government in Constantinople and the Bolsheviks' rise to power.

In Russia, after 1990, a substantial interest developed in "compatriots in exile", as evidenced by the large number of books and articles (both academic and for the general public) and the radio and television programs devoted to this group over the past thirty years. In the present chapter, we are particularly interested in members of the intelligentsia of the old regime, especially academics, who were forced into exile. Different doctoral theses in Russia have been devoted to this subject: for example, (Bojchevskij, 2008) and (Efremenko, 2008), concerning the activity of scientific and cultural associations created in France by Russian exiles, and (Voloshin, 2012), who studies how Russian emigrants have adapted to different scientific and cultural habits abroad. Although these works provide rich information on many aspects of the intellectual life of the moment, one is struck by the fact that not only do they fail to refer to any recent study on emigration carried out outside of Russia, but, even more surprising, they are not based on any French archival source. As we have already observed in (Mazliak and Perfettini, 2021), this creates an ambiguous impression: the importance of national character within the Russian community seems somewhat accentuated by underestimating the fact that many of the exiles, caught in the struggle for their daily existence, were torn between attachment to their original identity (their "strangeness") and their desire to assimilate into their new environments.

Many studies insist on the important role of a dynamic intellectual elite that gave the necessary impetus for a resumption of scientific activity within the Russian community. Gousseff[2] describes this "*Russian exception*" as decisive in establishing a "*true society in exile*". She also shows how, within the intelligentsia itself, the trajectories were variable according to the personal situations and the networks involved. Professional organizations constituted privileged places of exchange. The creation

[2] (Gousseff, 2008), p. 153.

of the Russian sections of the Sorbonne[3] thus enabled many academics to find a new audience. In addition, both literary and scientific production by Russian emigrants was exceptionally large and varied. For Gousseff,[4] a singularity of the phenomenon of Russian emigration to France thus lies in the remarkable liveliness of its intellectual life. This continuity of individual careers from Russia to France was made possible thanks to a structured community organization and to an intense solidarity established through the creation of numerous organizations and associations of mutual aid.

If it was mainly exchanges with the French in artistic fields that attracted the attention of commentators, but scientific collaborations, while less often mentioned, were nevertheless numerous. The Institut Pasteur, which had been "*one of the emblematic places […] of Franco-Russian exchanges in the integration of scientists*"[5] since the 1880s, once again welcomed several Russian physicians and biologists.

The objective of the present chapter is to provide some additional information on the position of Russian scientists who emigrated to Paris in the interwar period, in particular, with regard to their differentiated situations according to the levels attained in their individual careers in Russia before their departure. In particular, the structures in which representatives of the Russian emigration academic community were able to take part are studied in order to highlight some strategies developed to ensure a certain continuity of activity and research. The study covers a period between 1920, when the association was created, and 1929. These years correspond to the most numerous wave of emigration. The year 1929 also constitutes a fairly natural limit in the study of the association, since its statutes were modified that year, resulting in a significant internationalization of activities. Some specific cases of mathematicians related to RAG have been discussed in (Mazliak and Perfettini, 2021), a text to which the interested reader can refer for further details.

2 A Role of Academic Support

The Russian Academic Group played a key role in the 1920s in allowing intellectual exiles to resume academic activity after their arrival in France. In this section, we examine how the RAG, through its statutes and its activity, favored such an initiative and also enabled young students to pursue or begin their studies in France.

2.1 Action Towards Experienced Scientists

> "An association known as the "Russian Academic Group" made up of Russian or French Russian academics who have contributed to education or science was formed in Paris with the aim to:

[3] Ibid. p. 148–149.
[4] Ibid.
[5] Ibid. p 150.

1. Maintain permanent contact between Russian academics abroad to help each other either in their scientific work or in practical matters;
2. Study the French school system with a view to bringing French and Russian pedagogy closer together;
3. Maintain, for Russian schoolchildren and students studying in France, permanent contact with their homeland by contributing to their education, either in school or university;
4. Spread more in-depth knowledge of the Russian language and Russia in France."[6]

On October 19, 1920, the Russian Academic Group in Paris was created and its head office was set up at 96 boulevard Raspail in the sixth *arrondissement* (district). Administered by a bureau elected for one year, the association was made up of active members, founders and correspondents, who paid an annual subscription of membership according to their statute. It also had honorary members who were exempt from this contribution. All the actions carried out were decided at general meetings convened by the bureau at least once per quarter. Established in order to bring together Russian intellectuals based in Paris and provide them with representation, these meetings required that at least two thirds of the members of the Group be gathered. The creation of this association came at a time marked by an impulse of self-organization within the Russian community, an impulse that lasted throughout much of the 1920s. This "*autonomous micro-society, with its own institutions and structures*"[7] required an organization that could unite the entirety of the intelligentsia in exile and provide it with the specific help it needed. Created through the initiative of, among others, the historian and writer Evgueni Vassilevitch Anitchkoff[8] (1866–1937), who was the first president of the RAG, the association aimed to fulfill these various functions, and thus ensure that the activity of those maintaining Russian intellectual life could continue under the troubled conditions of exile. Shortly after the foundation, at a time when it was still composed of only

[6] "Une association dite "Groupe Académique Russe" comprenant des universitaires russes ou français russisants, ayant contribué à l'enseignement ou à la science, s'est constituée à Paris dans le but de : 1. Maintenir un contact permanent entre les universitaires russes se trouvant à l'étranger pour s'entraider soit dans leurs travaux scientifiques, soit pratiquement ; 2. Étudier le système scolaire français en vue d'un rapprochement entre la pédagogie française et russe ; 3. Maintenir, pour les écoliers et étudiants russes faisant leurs études en France, un contact permanent avec leur patrie en contribuant à leur éducation, soit scolaire, soit universitaire ; 4. Propager la connaissance plus approfondie du russe et de la Russie en France." Statuts de création du Groupe Académique Russe à Paris, Archives nationales, 70AJ/146.

[7] (Menegaldo, 1998) p. 37.

[8] Recipient of a Bachelor of Arts from the University of Saint Petersburg in 1892, Anitchkoff (Евгений Васильевич Аничков) was a professor attached to the Chair of the History of Western European Literature and lecturer in English at the University of Kiev. Subsequently, he returned to Saint Petersburg and taught at the University's Faculty of Letters, at the Bestuzhev courses (see note 29) and at the Psycho-Neurological Institute. Regularly going on missions abroad during this period, notably in France and England, he was recruited during the First World War within the Russian expeditionary force in France. After the war, he settled in Paris before leaving for Yugoslavia shortly after the creation of RAG. See (Brockhaus and Efron, 1911) p. 469 and (Nikolaev, 1989) p. 77–78.

sixteen, almost exclusively Russian, members, Anitchkoff and the zoologist Sergei Ivanovitch Metalnikov[9] (1870–1946), provisional secretary of the RAG, launched a call and contacted a few dozen academics, Russian and French, to bring their support to the development of this enterprise. The number of members of the association gradually increased, exceeding one hundred as early as 1923. At the end of the decade, the various sections of the Group has attracted one hundred and thirty-three further members.[10] The on-going increase in these figures in the subsequent years testifies to a certain success of the self-proclaimed mission of the association, at least from a quantitative point of view. Russian academics based in Paris responded positively to the rallying call, and many of them were able to benefit from the help and material support provided by the RAG in the pursuit of their personal careers. One can observe that specialists in law were particularly numerous in the association.

The first of the nine articles that made up the statutes of the association—cited at the beginning of this section—set the general objectives and the guideline for the Group's work. Between the four goals stated in this article, the most important was clearly the first. The priority of the RAG was to provide academic and practical support to Russian academics based in Paris on the one hand and to offer courses for Russian students whose studies had been interrupted on the other. To fulfill this double objective, the RAG created, within the Sorbonne, three *Russian sections*. Thanks, in particular, to "*the warm welcome and the effective support of the professors of the Sorbonne*",[11] it was first decided to set up lectures in law. At the beginning of January 1921, the University Council of the University of Paris supported the decision of the Law Faculty to open such courses. It validated the programs offered and accepted the candidates who presented themselves to read the lectures.[12] In order to be able to pay the professors in charge of these lectures, the French Ministry of Foreign Affairs allocated a credit of 50,000 francs per year. The lectures started on January 17, 1921.[13]

These lectures essentially fulfilled two distinct functions. On the one hand, they allowed Russian students who had interrupted their studies when they left Russia to resume them and complete their training. On the other hand, they provided the selected professors with the opportunity to find an audience and ensure their material life without having to make a living with another kind of activity. Once these practical difficulties were resolved, the RAG hoped that these academics would thus be able to devote themselves more to the continuation of the work they had begun in Russia.

[9] Metalnikov (Сергей Иванович Метальников) had been, since 1907, a professor of zoology within the Lesgaft Laboratory of the University of Saint Petersburg, taking over directorship of the lab in 1909. In 1918, he left for Simferopol to take part in the creation of the University of Crimea only to find himself blocked by the civil war. Unable to go back to Saint Petersburg, he accepted, in 1919, an invitation to work at the *Institut Pasteur* in Paris. See (Upyankina, 2010) and (Metalnikov, 1946) p. 860–861.

[10] Rapports annuels d'assemblées générales. Archives nationales, 70AJ/147.

[11] Mémorandum, March 10, 1925, Archives nationales, 70AJ/147.

[12] In the absence of documents, we unfortunately do not know who the candidates in question were.

[13] Mémorandum, March 10, 1925, Archives nationales, 70AJ/147.

The creation of this Russian section fit perfectly with the general mission that the association had set for itself. Beyond the charitable aspect of such an action, the aid measures for these important actors within Russian science helped to guarantee its continuity despite the exile of a significant portion of its representatives. Thus, the Group did not play a role grounded merely in mutual aid and solidarity. On the contrary, it desired to go beyond this position in order truly to really define itself as one of the main actors in the renewal of this academic life that would preserve Russian science.

The following year, on January 30, 1922, the *Commission for the Organization of Russian Education in France* (from hereon, COREF) was created at the Institute of Slavic Studies at the University of Paris.[14] The mathematician Paul Appell (1855–1930), the rector of Paris Academy, was appointed president, and Louis Gentil (1868–1925), a professor of physical geography at the Sorbonne, was vice-president. Five French specialists in Slavic studies became members of this commission: Paul Boyer (1864–1949), administrator of the School of Oriental Languages and founder, in 1921, of the *Revue des études slaves*, Louis Eisenmann (1869–1937), historian and professor of Slavic studies who, in 1922, became secretary general of the Institute for Slavic Studies, Emile Haumant (1859–1942), a professor of Russian language and literature at the University of Paris, André Mazon (1881–1967), a recognized Slavist who was a professor at the Collège de France from 1923, and finally Jules Patouillet (1862–1942), a lecturer in the Russian language and literature at the Faculty of Letters in Lyon and also one of the five RAG vice-presidents. On the Russian side, one finds a large portion of the members of the RAG bureau: the economist Alexei Nicolaevich Antziferoff[15] (Fig. 1) (1867–1943), who was president of the association, lawyer and former politician Pavel Pavlovitch Gronsky[16] (1883–1937) and Metalnikov, both vice-presidents of the RAG, philologist Nicolaï Karlovitch Koulman[17] (1871–

[14] On the Institute of Slavic Studies, consult (Fichelle, 1951).

[15] Attached to the University of Kharkov in 1903, Antziferoff (Алексей Николаевич Анцыферoф) taught economic statistics there for many years. He was appointed professor there in 1917 after the presentation of his PhD. He did not hide his anti-Bolshevik feelings, and when the Red Army occupied Kharkov in 1919, Antziferoff was forced into exile. He arrived in France in early 1920. See (Koritski and Dmitriev, 2000).

[16] After studying at the Faculty of Law of the University of Saint Petersburg, Gronsky (Павел Павлович Гронский.) undertook a political career, which led him to various posts; elected to the Duma in 1912, he participated in numerous commissions, including the one in charge of questions linked to the convocation of the constituent assembly in March 1917. He actively participated in the events of February 1917, but publicly opposed Soviet power afterwards, resulting in several arrests. Finally, he fled Russia towards the end of 1919, settling in Paris in 1920. Beyond his involvement in the associative life of Russian emigration in Paris, he was known as a member of two Parisian masonic lodges. See (Serkov, 2001).

[17] After studying at the University of Saint Petersburg, Koulman (Николай Карлович Кульман) gradually came to specialize in 19th century Russian history and literature. After emigrating to France in 1920, he gave lectures on Russian literature on several occasions in Belgrade and Sofia. See (Brockhaus and Efron, 1915) p. 628 and (Yanchenko, 2006).

Fig. 1 The economist Alexei Nikolaevitch Antziferoff (1867–1943)

1940), and politician Evgraf Petrovitch Kovalevsky[18] (1865–1941). The purpose of this commission was to *"promote the scientific activity of Russian academics in France, as well as education, secondary and higher, to give to Russian youth"*.[19] Officially, the commission was brought about to exercise control over the activities of the association on the French academic side. However, since its members were mostly linked to the RAG—Gentil, for instance, was vice-president of the commission, but he held the same position in the RAG until his death in 1925—it allowed the Group to enjoy more legitimacy in the eyes of the French officials while maintaining relative independence. The commission intervened in the decisions and organization of the various Russian sections; not only the Russian section of Law, already mentioned, but also those that were established a few months later, midway through 1922: the Letters section, the purpose of which was to *"give Russian philologist students the facility to attend lectures on subjects not included in the teaching program of the*

[18] An important Russian political figure of the beginning of the 20th century, Kovalevsky (Евграф Петрович Ковалевский) specialized in educational matters, notably, within the Duma of which he was a member on several occasions. In 1919, in opposition to the Bolshevik regime that was gradually consolidating itself in Russia, he emigrated to France. He lived for some time in Nice before settling permanently in Paris. Besides his involvement in the associative life of the Russian emigration, he played a leading role in the organization of the Orthodox church within this community. See (Zernov, 1973).

[19] Mémorandum, March 31, 1925, Archives nationales, 70AJ/156.

University of Paris"[20] and the Sciences section, the mode of operation of which was somewhat different. In a letter to the journalist Gabriel Gobron (1895–1941), Leon Ivanovitch Kepinov[21] (1881–1962), doctor of medicine and former secretary of this section, explained that "*the Russian Section at the Faculty of Sciences of the University of Paris [did] not have exactly the same organization as the other two sections, namely that there [were] only a few professors who [read] lectures as many of them had a full-time work in laboratories where they [continued] their scientific research.*"[22] Each year, some of the section's scientists were indeed able to devote themselves exclusively to the research work that they carried out in different laboratories of the Sorbonne or the Pasteur Institute without engaging in any teaching. The activity reports bear witness to this phenomenon: for the 1923–1924 academic year, for instance, only four out of a total of at least eight members of the Science section taught a course for Russian students at the University of Paris. Contrastingly some scientists, such as Ervand Gevorgovitch Kogbetliantz[23] (1888–1974) or Sergei Evgenevitch Savich[24] (1864–1946), to whom we will return later, taught for many years without ever being affiliated with any scientific laboratory. Each of the sections benefited, like the Law section, from a credit of 50,000 francs allocated by the Ministry of Foreign Affairs. The Commission appointed two academics per section, one Russian and one French, to ensure control of this budget. They were entrusted with *"the care of studying and proposing candidates for permissions and lectures"*[25] provided in each of the Russian sections. Thus, the jurist Albert Wahl (1863–1941) and Gronsky took charge of the Law section, Haumant and Koulman of the Letters section, and Gentil and Metalnikov of the Sciences section.

During the academic year 1922–1923, the first year of common existence of the three Russian sections, 19 courses were given,[26] but the reception by the students was so positive and their mobilization so extensive that this figure did not stop growing in the following years. Thus, for the 1924–1925 academic year, for example, 16 courses were set up for the Law section, just as many for the Letters section, and 13 courses were held within the Sciences section. Access to all these courses was always free. If the audience remained predominantly Russian, a good number of French, Serbian and Czech students also regularly followed some of these courses, given either in Russian or in French, depending on the choice of the teacher. In the years 1921–1925, nearly 150 courses were given by Russian teachers within the

[20] Mémorandum, March 10, 1925, Archives nationales, 70AJ/147.
[21] After studying at the Moscow Law School, Kepinov (Леон Иванович Кепинов) specialized in medicine, which he studied at the Universities of Moscow and Heidelberg. After his first position at Saint Petersburg, he lived on the shores of the Black Sea before emigrating to Paris in 1920. There, he joined the physiology laboratory of the *Institut Pasteur*. See (Spectorsky, 1970) p. 147–148.
[22] Letter from Kepinov to Gobron, May 12, 1925, Archives nationales, 70AJ/149.
[23] Ервcovand Геворгович Когбетлянц.
[24] Сергей Евгеньевич Савич.
[25] Extrait du procès-verbal de la séance du 4 avril 1922, Archives nationales, 70AJ/146.
[26] Mémorandum, March 10, 1925, Archives nationales, 70AJ/147.

three sections and nearly 300 scientific memoirs, articles and other communications, covering all the disciplines, were published, both in Russian and French.[27] This relatively high figure testifies to the particularly intense and sustained activity of the Russian academic environment in Paris, at least in the first half of the 1920s. Despite their often precarious administrative and material situation, Russian intellectuals, thanks to the collective mobilization of some of them, notably through the RAG, were able to ensure a remarkable academic continuity. Most of the members of the Science section had the opportunity to work closely with their French counterparts in different laboratories at the Sorbonne, the Museum of Natural History and the Institut Pasteur.

From September 1922, one of the courses offered in the Science section was devoted to mathematics and was soberly entitled "general mathematics". This course was taught by Kogbetliantz, who arrived in France in July 1921, and whose eventful trajectory is presented in detail in (Mazliak and Perfettini, 2021). Upon his arrival, Kogbetliantz contacted the RAG and became a member of the association. When the Russian section of the Sorbonne in Sciences was inaugurated in 1922, Kogbetliantz was appointed to give the course in general mathematics. In the years that followed, he also took charge of the exercise lessons in analytical geometry and mechanics provided within this section. It is difficult to determine the extent to which the professional and personal relationships that Kogbetliantz managed to maintain with his French counterparts were either linked to the intervention or influence of the RAG or resulted from entirely individual initiatives. At any rate, from a pecuniary point of view, for some time, the mathematician seems to have made his living only from the indemnities that the RAG paid him for his activities within the Russian section of Sciences. As explained in (Mazliak and Perfettini, 2021), apart from a short period when he worked for the *Compagnie Française des Pétroles* (French Oil Company), Kogbetliantz kept his RAG course until the mid-1930s.

A second course in mathematics was set up within the Sciences section of the RAG. Entitled "Differential and integral calculus", it was provided by Savich, who had arrived in France in the early 1920s. Ermolaeva[28] studied the life of this mathematician before he left Russia. Born in 1864 in Saint Petersburg, Savich studied at university and quickly became interested in several mathematical fields, such as the analytical theory of differential equations and the theory of analytical functions. He then began a teaching career at prestigious military institutions, where he was responsible for, among other things, lectures in analytical geometry or differential equations, after which he transferred to Saint Petersburg. There, he first taught in the Bestuzhev courses[29] before joining the Polytechnic Institute of Saint Petersburg,

[27] Mémorandum, March 31, 1925, Archives nationales, 70AJ/156.
[28] (Ermolaeva, 2012).
[29] Besthuzhev courses (Бестужевские курсы) were courses for women only. Established in 1878, they were one of the first higher education institutions for young girls in imperial Russia. They had been set up with the aim of offering women, who, until then, had been forced to study abroad, the possibility of following a higher education course in Russia. See (Fedosova, 1980) and Gouzévitch and Gouzévitch (2000).

where he had obtained his first position as a full professor in 1906. During these years, Savich had published numerous works on the theory of functions and differential and integral calculus, several of which were presented at the Mathematical Society, of which he had been a member since 1891. He also specialized in actuarial sciences and had participated in numerous international actuarial congresses of which he had sometimes been the vice-president, as in Brussels in 1895 or London in 1898. A member of a family of senior military officers from the old regime, he had to flee Russia soon after 1917.

When he arrived in Paris, Savich was therefore a recognized mathematician whose career was already well underway. However, while his participation in international congresses and his numerous publications (admittedly, in Russian) could have made his task easier, he seems to have had difficulties in continuing his work and participating in scientific life in France. Shortly after his arrival in Paris, he approached the RAG, which decided to entrust him with the responsibility of a mathematics course within the Sciences Section that had just been created. Savich taught this course for many years, but unlike most scientists in the Science section of the Sorbonne, he did not belong to any research laboratory. In 1924, he also became a vice-president of the Group and remained in that position at least until the end of the decade. Despite his investment in and his proximity to the association—and thus to the scientific effervescence that accompanied its development—Savich seems to have stopped all research activity after his arrival in France. We could find no publication dating from after his settlement in France, and the only trace of scientific activity outside the RAG was his presence at the eighth international congress of actuaries in London in 1927[30] and at the international congress of mathematicians in Zurich in 1932, an event that he attended without presenting any material.

2.2 Action Towards Students

In addition to the total of 150,000 francs allocated to the Russian sections, an additional credit of 50,000 franc per year was allocated to the RAG for the institution of 400 franc (per month) grants. The association had indeed set itself the objective of helping young Russian students who emigrated to Paris; the institution of these grants allowed students to devote themselves exclusively to their studies. In the early 1920s, "*the emigrants generally thought that the revolution would not last*".[31] The primary purpose of these grants was therefore to provide assistance for the training of those people who were to become the future managerial staff of a Russia liberated from the Bolshevik yoke. The choices of the French government, hostile to the new Soviet state, followed this logic and reinforced this conviction; it had decided to maintain relations with the representatives of Russian diplomatic representations

[30] Avant-propos, *Théorie élémentaire de l'assurance vie et capacité de travail*, S. E. Savich, 3rd edition, Janus-K, 2003, available in Russian at http://www.znay.ru/library/books/0638.shtml.
[31] Hélène Carrère d'Encausse, cited in (Menegaldo, 1998) p. 30.

as they existed before October 1917. The Russian diplomats who were present in France kept their official statutes and, in the eyes of the French officials, they continued to represent the interests of Russians living on French soil.[32] However, after the recognition of the USSR by France in 1924, these official diplomatic representations disappeared and the Russian community gradually lost hope of a quick return to normal.

The distribution of the 200,000 francs offered by the French Government to Russian scholars was made through and under the control of the COREF. For scholarships, the RAG was responsible upstream for selecting the most relevant candidates and then submitting these proposals to the committee. In practice, however, the exchanges often took place in both directions. If the final decision was really up to the commission, the RAG was consulted and its opinion weighed heavily. Thus, in February 1923, following a letter from Gentil, the vice-president of the commission, the secretary of the RAG, Kepinov, wrote to him:

> "We have the honor to provide you with the applications and documents from the Russian students, which you have kindly transmitted to us for our opinion on them. Here are the students for whom we give a favorable opinion and for whom we pray that you will not refuse your support."[33]

Conversely, after being asked about a young chemist whom the Group wished to take care of, Eisenmann, a member of the committee, informed the RAG of his opinion:

> "Mr. Stephen [sic] Soloviev, recommended to me by our colleague Paul Boyer, came to see me before and after his visit to the Group. His case seems embarrassing to me and I only see two solutions: 1.In accordance with indications that I had the honor to submit to you a few months ago, the Group would subject him to an examination after which, if he passed the tests, you would issue a certificate stating that he has the knowledge corresponding to a particular year of study in Russia. In this way he could register at the Faculty of Sciences, with a perspective of acceding later to the Institute of Applied Chemistry as he wishes. 2.If, as he himself seems to say, Mr. Soloviev is a little "rusty", maybe we should consider the idea of placing him in a *lycée* for a year, where he could prepare either for the French baccalaureate, for a Russian exam in front of the members of the Group or for the competition of the Institute of Applied Chemistry for next year. In either case, moreover, Mr. Soloviev's qualifications for obtaining one of the grants from the Russian Teaching Commission should be examined. I transmit this letter to Mr. Paul Boyer. The case is, moreover, one that we will be able to discuss at Friday's meeting either in committee or between us."[34]

[32] On the French policy of welcoming immigrants in this period, consult (Gousseff, 2008), especially Chap. 9.

[33] "Nous avons l'honneur de vous remettre les demandes et documents des étudiants russes, que vous avez bien voulu nous transmettre pour avoir notre avis à leur sujet. Voici les étudiants dont nous donnons un avis favorable [sic] et auxquels nous vous serions reconnaissants de ne pas refuser votre appui." Letter to Louis Gentil, February 9, 1923, Archives nationales, 70AJ/150.

[34] "M. Stephen [sic] Soloviev que m'a recommandé notre collègue Paul Boyer, est venu me voir avant et après la visite qu'il a rendue au Groupe. Son cas me parait embarrassant et je ne vois que deux solutions : 1.Conformément à des indications que j'ai eu l'honneur de vous soumettre il y a

The allocation of a grant was the result of a genuine discussion among all the actors, and not of unilateral decision-making: The RAG archives attest to the existence of a permanent dialogue between the various RAG members, both Russian and French, and the members of the commission.

In December 1924, the RAG sent Eisenmann a list of ten applicants for the grants, including the young mathematician Vasili Grigorevich Demtchenko[35] (1898–1972). In 1919, this young student, a native of Kiev, where he had just graduated from the faculty of physics and mathematics, had already spent time in France after having fled from Russia with his family.[36] This first stay had, however, been very brief, and a little later, in 1920, Demtchenko had settled in Belgrade in Yugoslavia,[37] where he spent several years as a math teacher at the Subotica high school, from 1921 to 1925. In parallel, Demtchenko had prepared a doctorate in theoretical mechanics[38] under the direction of Anton Dmitrievich Bilimovitch (1879–1970), himself a Russian emigrant and professor of applied mathematics at the University of Belgrade since 1920. Demtchenko had contacted the RAG in 1924 to obtain one of the grants that the association had set up.[39] Bilimovitch and the Serbian mathematicians Milutin Milankovitch (1879–1958) and Mihailo Petrovitch (1868–1943), who constituted his thesis jury, had recommended his candidacy to the association (Fig. 2).

Once his grant application had been accepted, Demtchenko moved to Paris in February 1925, and began a PhD in hydrodynamics supervised by Paul Painlevé (1863-1933). A RAG activity report for the year 1925[40] indicates that Demtchenko, having arrived in France, received the "*kindest welcome and encouragement throughout the academic year*" from Albert Métral (1902–1962) and Albert Toussaint (1885–1956), both professors in the Chair of fluid mechanics at the Sorbonne. Demtchenko, during his first year in France, attended multiple courses and conferences, which allowed him to make contact with the mathematicians Elie Cartan (1869–1951), Georges Bouligand (1889–1979) and Henri Villat (1879–1972). He also followed

quelques mois, le Groupe lui ferait subir un examen après lequel, s'il satisfaisait aux épreuves, il lui serait délivré par vous, un certificat constatant qu'il possède les connaissances correspondantes à telle ou telle année d'études en Russie. De la sorte il pourrait s'inscrire à la Faculté des Sciences, en vue d'entrer plus tard à l'Institut de Chimie appliquée comme il le souhaite. 2.Si, comme il semble le dire, M. Soloviev est un peu "rouillé" peut être faudrait-il envisager l'idée de le faire entrer pour un an dans un lycée où il pourrait se préparer soit au baccalauréat français soit à un examen russe devant les membres du Groupe, soit au concours de l'Institut de chimie appliquée pour l'an prochain. Dans l'un ou l'autre cas, d'ailleurs, il y aurait lieu d'examiner les titres de M. Soloviev à obtenir l'une des bourses de la Commission d'enseignement russe. Je donne communication de cette lettre à M. Paul Boyer. L'affaire est d'ailleurs de celles dont nous pourrons nous entretenir à la réunion de vendredi soit en commission, soit entre nous." Letter from Eisenmann, June 18, 1923, Archives nationales, 70AJ/150.

35 Василий Григорьевич Демченко.

36 Rapport, June 1960, Archives de la préfecture de police de Paris.

37 Dossier individuel de Demtchenko, Archives nationales, 70AJ/151.

38 Listes des boursiers des hautes études, March 14, 1927, Archives nationales, 70AJ/157.

39 Letter from the RAG to Eisenmann, December 7, 1924, Archives nationales, 70AJ/150.

40 Extrait des comptes rendus des professeurs russes et boursiers de la faculté des sciences, années scolaire 1925–1926, Archives nationales, 70AJ/157.

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1994

THÈSES

PRÉSENTÉES

A LA FACULTÉ DES SCIENCES DE PARIS

POUR OBTENIR

LE GRADE DE DOCTEUR ÈS SCIENCES MATHÉMATIQUES

PAR

Basile DEMTCHENKO

1re THÈSE. — I. SUR LES CAVITATIONS SOLITAIRES DANS UN LIQUIDE INFINI.
II. SUR L'INFLUENCE DES BORDS SUR LE MOUVEMENT D'UN CORPS SOLIDE DANS UN LIQUIDE.

2e THÈSE. — PROPOSITIONS DONNÉES PAR LA FACULTÉ.

Soutenues le 2 JUIN *mai 1928 devant la Commission d'examen*

Président : MM. PAINLEVÉ.
Examinateurs { VILLAT. MONTEL.

Librairie Scientifique
ALBERT BLANCHARD
3 et 3 *bis* Place de la Sorbonne
PARIS (Ve)

1928

Fig. 2 The cover of Basile Demtchenko's dissertation at Paris University

the Hadamard seminar at the Collège de France for two years. In the spring of 1926, a little over a year after his final settlement in France, Demtchenko gave a series of lectures (in Russian) on rational mechanics within the framework of the Russian section of the RAG.[41]

[41] Ibid.

If the young man had many links with French scientists, he also found, in the person of Dmitri Pavlovitch Riabouchinsky (1882–1962), a "*caring guide*"[42] who, like him, had fled Russia in 1918 and settled in Paris in 1919. Being an aeronautical specialist (he had founded the first aeronautical institute in the world in Koustino, near Moscow) close to Painlevé, Riabouchinsky had discussed a thesis at the Sorbonne on questions of hydrodynamics in 1922.[43] He took Demtchenko under his wing and suggested lines of research for him,[44] which allowed the latter to publish several articles on fluid mechanics and hydrodynamics, often linked to Riabouchinsky's own work.[45] However, Demtchenko gradually put aside these themes to devote himself solely to aerodynamics and mechanical engineering and, in the 1930s, he left the academic world to join the industrial sector. For many years, he worked for the Zenith Carburetor Company, for which he studied and designed car and aircraft engines, his career there culminating in his 1955 appointment as director of aeronautical studies. During the development of his industrial career, Demtchenko remained close to the Russian community established in Paris. He held the post of secretary of the *Société Russe de Philosophie des Sciences* (Russian Society for the Philosophy of Science) for many years. This association, founded by Riabouchinsky in 1930, the headquarters of which were established at his home, was intended to "*keep its members informed of the development of the different branches of science, as well as of the advancement and propagation of studies in philosophy of science*".[46] In 1963, Demtchenko also became vice-president of the RAG,[47] which still had around fifty members at the time.[48] Finally, in 1966, he became responsible for all the mathematical and physical material received as part of the preparation of the book (Shelokhaev, 1997), a gigantic enterprise that aimed to testify to the existence of a Russian micro-society in exile.

The aforementioned letter from Eisenmann, dated from June 1923, highlights another important activity of the RAG. To help Russian students to enroll in French higher education establishments, the RAG first provided them with a certificate of previous enrollment in the various Russian schools, universities and institutes. This point, however, quickly became problematic: a registration certificate guaranteed neither success in examinations nor a diploma. It was therefore complicated to justify any equivalence with the corresponding levels in the French system. Eisenmann thus proposed to strengthen the role of the RAG:

[42] Ibid.

[43] (Fontanon, 2007).

[44] In the activity report mentioned above, it is indicated that the two articles that made up Demtchenko's thesis had been suggested by Riabouchinsky himself.

[45] For example, (Demtchenko, 1930) and (Demtchenko, 1931).

[46] Rapport, June 1960, Archives de la préfecture de police de Paris.

[47] Cf. (Mnoukhine et al., 2010) pp. 473–474.

[48] Rapport d'enquête sur le Groupe Académique Russe, 1963, Archives de la préfecture de police de Paris.

> "The Ministry frequently consults us on requests for equivalence, especially for the *baccalauréat*, presented by Russian students. [...] To ensure the success of these requests, which we want as much as you, it would be necessary that each of them was accompanied by a certificate issued by you, one that would somehow replace the school report of the student in question. The nature and degree of the institution where the student was enrolled should be specified, and mention should be made of the diplomas prepared or obtained (in particular with regard to the *baccalauréat*), or, alternatively, your Group should expressly declare with its authority that the applicant's studies and knowledge justify the desired equivalence."[49]

Of the two options proposed by the secretary general of the Institute for Slavic Studies, the Group decided to keep only the second one. It therefore set up special examination commissions intended to validate a certain level of higher education. The association's responsibility and role were thus greatly increased. The confidence that the French Government had in Russian scientists in the realization of such a plan did not escape Antziferoff, who expressed, in his response to Eisenmann, his gratitude towards France and affirmed that such certificates would only be issued to *"people undoubtedly deserving it"*.[50] This ability to be a warrant for the expertise of Russian students—and, more generally, of Russian emigrants—with French institutions was of paramount importance for the RAG. Most of the exiles had fled Russia leaving everything behind. Being able to officially prove a certain level of study, a certain level of skill, was necessary for them if they hoped to find an acceptable socio-professional place in French society. Thanks to the system put in place by the RAG, their previous existence, the life before exile, was recognized, allowing them to transcend the sole designation of refugee.

This type of certificate, linked to the academic nature of the RAG, did not, however, constitute the only attestation that it was led to issue. To fulfill its social role as a self-help association, it took care of a certain number of "daily" cases that were aimed at helping Russian emigrants, particularly with regard to the administrative procedures linked to taxes on the foreigners' ID cards. Certificates can thus be found in the Group's archives that stated officially that such a person, because of his or her low income or unemployment, could not pay this tax. Other certificates, established in collaboration with the *Office National des Universités et Écoles Française* (National Office of French Universities and Schools), attested to the status of certain students or scientists established in France in order to allow them to benefit from a reduced rate for obtaining their residence permit. A decree from September 9, 1925,

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[49] "Le Ministère nous consulte fréquemment sur des demandes d'équivalence, notamment du baccalauréat, formées par des étudiants russes. [...] Pour assurer le succès de ces demandes que nous souhaitons autant que vous, il serait nécessaire que chacune d'elle fût accompagnée d'un certificat délivré par vous, et qui remplacerait en quelque sorte le livret scolaire de l'étudiant en question. Il faudrait que la nature et le degré de l'établissement où était inscrit l'étudiant y fussent précisés et que mention fût faite des diplômes exigés ou obtenus (en particulier en ce qui concerne le baccalauréat) ou bien que votre Groupe déclarât expressément avec son autorité que le demandeur justifie d'études et de connaissances qui méritent l'équivalence sollicitée." Letter from Eisenmann to Antziferoff, January 30, 1923, Archives nationales, 70AJ/150.

[50] Letter from the RAG bureau to Eisenmann, February 19, 1923, Archives nationales, 70AJ/150.

mentioned several specific cases of reduction in the rate of the foreigners' ID card tax, in particular with regard to "*students and pupils of the different categories of education registered in the faculties, or registered in the public schools or in private institutions*".[51] In 1925, this reduction made it possible to lower the tax in question from sixty-eight francs to ten francs. The following year, notably due to a fairly high rate of inflation, the tax increased to 375 francs, but for the beneficiaries of this reduction, it only increased by thirty francs.[52] Given the fragile situation and the meager income of a great number of the RAG scientists, such certificates turned out to be crucial, and the association thus also played an important role in mutual aid, in addition to its academic role.

3 1925, a Year of Rupture?

The RAG seems to have functioned during the first half of the 1920s without much difficulty; the projects it had set up were covered by a budget financed by membership fees and, above all, subsidies from the French government. The Russian sections of la Sorbonne attracted an increasing number of students, and the grants distributed by the association enabled many people to complete their studies in a more favorable financial situation. However, on November 3, 1924, six days after the official recognition of the USSR by France, the President of the Council of Ministers informed the Rector of the University of Paris of the suspension of the fundings allocated by the Government to Russian professors starting on July 1, 1925.[53] The establishment of diplomatic relations with the USSR signaled the end of the recognition of the former Russian consular organizations as official representatives for Russian emigrants. The Central Office for Russian Refugees, a private association recognized by the French government, was created to continue these diplomatic missions.[54] In this new framework, the French government probably wished to change its policy towards associations of Russian emigrates. In response to this decision, on March 10, 1925, the RAG wrote a first memorandum in which it set out all the actions carried out by Russian scientists through the association to ensure the continuity of Russian science: the institution of Russian sections, grants, material assistance and support provided to Russian scientists and youth, etc. This report of more than five pages ended with an assumed position against the decision made a few months earlier:

> "The suspension of material aid cannot but seriously affect all the manifestations of the activity of Russian professors, either in the field of education or in the scientific field, for they will be forced to procure means of existence outside of education, which threatens to completely annihilate everything that has been organized with such effort. Taking into consideration all that has been said above, the Russian Academic Group considers that it

[51] Décret du September 9, 1925, article 13, Journal Officiel de la République.
[52] Décret du November 30, 1926, articles 14 et 15, Journal Officiel de la République.
[53] Mémorandum, March 10, 1925, Archives nationales, 70AJ/146.
[54] See (Gousseff, 2008), Chapter 9.

> would be highly desirable for the French Government not to suspend the allocations offered to date to the Sections of Law, Letters and Sciences that represent the sum of 200,000 francs per year."[55]

The Group's charity work with its members was placed at the center of the report. Their members wanted to underline the importance of the material aid that the association brought to many Russian emigrants since the introduction of subsidies from the French State, even if it were to put the academic and scientific character of these actions in the background. Antziferoff and Kepinov, president and secretary of the RAG, respectively, as well as the deans of each of the three Russian sections, signed this document.

In addition to this document, the authors of the report wrote, now as Russian members of the COREF, a second memorandum mainly related to the professional activity of Russian scientists. They provided a detailed list of lectures given at the various Russian sections during the first semester of the contemporary academic year. A complete inventory of the works published by Russian professors in Paris from 1920 to 1924 was also added, as well as a list of those who had obtained the approval of the "Carnegie Endowment for International Peace"[56]—and therefore enjoyed a certain recognition. In the 17 pages constituting the document, the RAG was never cited or even mentioned.

The first part of the introductory text to this second memorandum was quite similar to the previously written report, since it provided a factual description of the various actions undertaken with regard to Russian scientists living in France. But in the rest of the text, the position adopted was quite different; the authors sought to give themselves significant scientific legitimacy in order to establish themselves as representatives of international science in the same way as their French counterparts. They paid particular attention to the link that had to be maintained between France and Russia. For them, the grants were of primary importance for strengthening this link, and they did not insist on the individual material help that they could bring to the members of the group. On the contrary, they lent them a symbolic and moral value intended to bring the two countries closer:

[55] "La suspension de l'aide matérielle ne peut pas ne point influer sérieusement sur toutes les manifestations de l'activité des professeurs russes, soit dans le domaine de l'enseignement, soit dans le domaine scientifique, car ils seront forcés de se procurer des moyens d'existence en dehors de l'enseignement, ce qui menace d'anéantissement complet tout ce qui a été organisé avec tant de peine. Prenant en considération tout ce qui a été dit plus haut, le Groupe Académique Russe estime qu'il serait fort désirable que le Gouvernement Français ne suspendît point les crédit affectés jusqu'à ce jour aux Sections de Droit, de Lettres et de Sciences et qui atteignent la somme de 200.000 francs par an." Mémorandum, March 10, 1925, Archives nationales, 70AJ/146.

[56] The Carnegie Endowment for International Peace was founded in 1910 by the industrialist and philanthropist Andrew Carnegie with the aim of developing international cooperation in favor of peace, notably by supporting the development of international law and scientific research on the causes of war and practical methods for preventing it. See (Carnegie, 1931) and (Patterson, 1970).

> "It is obvious that this aid had no political character, it pursued only a noble aim of scientific culture, of civilization, a purely humanitarian task. This aid must, without question, play an important role in bringing two great nations together."[57]

Finally, in the conclusion, the tone adopted was also clearly less peremptory and the emphasis was again placed on the brotherhood that existed between Russian and French scholars:

> "The undersigned Russian members of the Commission consider that the aid given to emigrant academics should not be suspended; they attribute to it an importance more moral than material, as one can judge from what has been written above. They are deeply convinced that the strongest ties are those that are based on the spiritual kinship of the intellectual classes of peoples, on the community of spiritual influences. From this point of view, the facilities granted to Russian professors to pursue their scientific work and their university education in close union with French scholars and professors have great value in many respects. As for the Russian youth, as well as the teachers currently in France, both will bring to Russia, one day, not only the knowledge acquired in France, but a feeling of gratitude towards the country that offered them hospitality and sincere affection, because the most appreciated friends are those who have been loved in adversity."[58]

After the official recognition of the USSR in October 1924, the French government wished to develop bilateral relations. The authors of the report took care to adopt a position that echoed this decision. They tried to highlight the way in which diplomatic, scientific or cultural relations between the two countries could benefit from the continued aid to the RAG. Rather than openly opposing a political decision that affected them closely, they chose to support French foreign policy by proving that maintaining the credits allocated to them did not contradict this policy.

We could not find any trace in the *Journal Officiel* of an effective decision to reduce subsidies, either in the autumn of 1924 or in the summer of 1925. It is therefore difficult to know whether the association actually lost its annual payments of 200,000 francs intended specifically for the operation of the three Russian sections. What is certain, however, is that these sections continued to exist. An activity report from May

[57] "Il est évident que cette aide n'avait aucun caractère politique, elle ne poursuivait qu'un noble but de culture scientifique, de civilisation, tâche purement humanitaire. Cette aide doit, sans conteste, jouer un rôle important dans le rapprochement de deux grandes nations." Mémorandum, March 31, 1925, Archives nationales, 70AJ/156.

[58] "Les soussignés, membres russes de la Commission, considèrent que l'aide apportée aux professeurs émigrés ne doit pas être suspendue ; ils lui attribuent une importance plutôt morale que matérielle, comme on peut en juger d'après ce qui a été dit plus haut. Ils sont profondément convaincus que les liens les plus solides sont ceux qui se basent sur la parenté spirituelle des classes intellectuelles des peuples, sur la communauté d'influences spirituelles. A ce point de vue, la facilité accordée aux professeurs russes de poursuivre leur travail scientifique et leur enseignement universitaire dans une union étroite avec les savants et professeurs français, a une grande valeur sous bien des rapports. Quant à la jeunesse russe, ainsi qu'aux professeurs se trouvant actuellement en France, les uns et les autres apporteront en Russie, un jour, non seulement les connaissances acquises en France, mais un sentiment de reconnaissance envers le pays qui leur a offert l'hospitalité, et d'affection sincère, car les amis les plus appréciés sont ceux qui l'ont été dans l'adversité." Ibid.

1928[59] indicates actions carried out by the Group identical to those undertaken before 1925; courses given at three faculties of the University of Paris for Russian students, an examination committee, issuance of certificates attesting to higher studies engaged in Russia, etc. It is most likely that only the grants had been canceled. The RAG resources during this period were also described in this report. At the time, they consisted of "*annual membership fees*", "*subsidies from various Russian institutions*" and "*deductions from wages received by professors, members of the said Group, teaching at the Sorbonne*".[60] The professors responsible for courses given in the Russian sections therefore still received financial compensation during this period and gave a part of it to the RAG. If the initial subsidies had indeed been abolished on July 1, 1925, it seems that they were replaced by another source of financing whose origin raises some questions.

Several hypotheses can be developed. The year 1925 marked the involvement of private investors in the RAG's activity. Following the decision to cancel the credits initially allocated, beginning in 1925, the Group began to establish contacts with various companies and individuals likely to offer them financial assistance. We find in the file of the National Archives a request[61] for material support from the *Rossia* insurance company[62] and a letter[63] to Franz Smulders (1871–1937), a Dutch aristocrat who was also contacted by the RAG and who agreed to support it "*in the noble but difficult task*"[64] that it had imposed upon itself. If the appropriations of the French Government had effectively been cut, it was essential for the Group to turn to other potential sources of income.

Furthermore, official recognition of the USSR came about almost simultaneously with the creation of the Emigration Committee, the general task of which was to defend the interests of Russian emigrants living in France.[65] In addition to this objective, similar to that of the Central Office for Russian Refugees, the Emigration Committee aimed to federate all of the aid associations created within the Russian community in exile. Another hypothesis would therefore consist in considering that this privileged interlocutor between the French government and all the associations had the capacity to allocate credits to some of them from a budget potentially received from the French State. The initial grants would simply have been replaced by another form of public funding. A deeper study of the actions of the Emigration Committee may provide some answers to the funding of these sections in the second half of the 1920s.

[59] Rapport d'activité, May 5, 1928, Archives nationales, 70AJ/157.
[60] Ibid.
[61] Letter to G. Ramsyr, May 30, 1925, Archives nationales, 70AJ/149.
[62] This was a joint stock company created in France at the end of the 19th century, Archives nationales du monde du travail, 115AQ030.
[63] Letter from Franz Smulders, November 19, 1928, Archives nationales, 70AJ/149.
[64] Ibid.
[65] See (Gousseff, 2008), p. 257.

4 An International Expansion

In the second half of the 1920s, the RAG entered into contact with new actors in order to expand its representation on the international scene. In this section, we examine how the intervention of these new partners enabled the association to pursue this objective and to accentuate its legitimacy in regard to several aspects.

4.1 The International Institute for Intellectual Cooperation, a Privileged Partner

> "A public establishment has been created in Paris, called the "International Institute of Intellectual Cooperation", having as its goal to give its assistance to all works of international character that tend to the progress of sciences, letters, arts and intellectual development of humanity through the collaboration of peoples."[66]

On December 31, 1924, the bill establishing the International Institute for Intellectual Cooperation (IIIC from hereon) was adopted. The organization was recognized by the government (*utilité publique*) and benefited from an important subsidy of several million francs coming from the Ministry of Public Instruction. In particular, it was decided that this institute would be organized and administered by the International Commission for Intellectual Cooperation of the League of Nations (LN from hereon).

The RAG did not remain indifferent to the birth of the IIIC. On the contrary, it seized the opportunity to get in touch with this new interlocutor that could represent a direct contact with a major international organization, and thus bring the cause of Russian emigrants to high-level officials. Taking advantage of the momentum created by the creation of the IIIC, the RAG published a *pro-memoria* in which it highlighted the international character of the Union of Russian Academic Groups founded in Prague, the central office to which it had been attached since its creation:

> "Wishing to participate in this movement of intellectual cooperation of peoples that the war had slowed down, Russian intellectuals have deemed it necessary to create in Prague a central institution, called 'the Union of Russian Academic Groups Abroad', intended to concentrate and organize, by methodical action, the vital forces of Russian intellectuals dispersed over the territory of different countries by the events of the civil war and the regime of terror in Russia. The Russian Union in question, on the basis of a moral agreement with the League of Nations, took part in the work of the 4th session of the Commission for Intellectual Cooperation which was held from 25th to 29th of the last July under the chairmanship of Mr. Bergson.[67] These

[66] "Il est créé à Paris un établissement public appelé "Institut International de Coopération Intellectuelle" ayant pour objet de prêter son concours à toutes les œuvres de caractère international qui tendent au progrès des sciences, des lettres, des arts et au développement intellectuel de l'humanité par la collaboration des peuples." Law project number 101, Chambre des Députés, Archives nationales, 70AJ/147.

[67] Henri Bergson (1859–1941), world famous French philosopher, chaired the International Commission for Intellectual Cooperation from its first session in August 1922 to 1925. More infor-

> procedures show that Russian intellectuals who have emigrated, notwithstanding the difficult conditions of their lives, are currently on the path towards a permanent collaboration with intellectuals from all over the world. Considering from this point of view the creation in Paris, thanks to France's abundantly enthusiastic and fruitful initiative, of a public institution, called the International Institute for Intellectual Cooperation, the purpose of which is to assist all the works of international character that tend to the progress of sciences, letters, arts and intellectual development of humanity through the collaboration of peoples, the Union of Russian Academic Groups in Prague, in concert with the Russian Academic Group in Paris, expresses the hope of holding an exchange of views with the competent authorities in order to examine the measures necessary to establish permanent contact between the Russian academic organizations and the Institute in question, with the intention, according to the propitious expression of the Minister of Public Instruction, of bringing together 'as many of these active institutions as possible through which we would be in daily contact with the best elements of intellectual life in great countries, especially in the field of science'."[68]

During the work of the International Commission for Intellectual Cooperation in July 1924 mentioned in this document, a report that helped define the status, functioning and program of the IIIC was drawn up, testifying to the role that Russian scholars had in the very establishment of the institute. Later, and to follow up on the quoted text, the RAG wrote to Julien Luchaire (1876–1962), the first director of the IIIC, asking him to receive professors Alexandre Alexandrovitch Pilenko[69]

mation can be found on the League of Nations Archives website http://libraryresources.unog.ch/lonintellectualcooperation/intro.

[68] "Désireux de participer à ce mouvement de coopération intellectuelle des peuples que la guerre avait ralenti, les intellectuels russes ont jugé nécessaire de créer à Prague une institution centrale, nommée 'l'Union des Groupes Académiques Russes à l'étranger', destinée à concentrer et organiser, par une action méthodique, les forces vitales des intellectuels russes dispersés sur le territoire de différents pays par les événements de la guerre civile et le régime de la terreur en Russie. L'Union russe en question, sur la base d'une entente morale avec la Société des Nations, prit part aux travaux de la 4ème session de la Comission de Coopération Intellectuelle qui s'est tenue du 25 au 29 juillet dernier sous la présidence de M. Bergson. Ces procédés constatent que les intellectuelles russes émigrés, nonobstant les conditions si difficiles de leur vie, sont actuellement sur les voies d'une collaboration permanente avec les intellectuels du monde entier. Envisageant à ce point de vue la création à Paris, grâce à l'initiative si heureuse et si féconde de la France, d'un établissement public, appelé Institut International de Coopération Intellectuelle, ayant pour objet de prêter son concours à toutes les oeuvres de caractère international qui tendent au progrès des sciences, des lettres, des arts et au développement intellectuel de l'humanité par la collaboration des peuples, l'Union des Groupes Académiques Russes à Prague, de concert avec le Groupe Académique Russe à Paris, exprime le voeu de procéder à un échange de vues avec les autorités compétentes dans le but d'examiner les mesures nécessaires pour établir un contact permanent des organisations académiques russes avec l'Institut en question, destiné, d'après l'expression heureuse de M. Le Ministre de l'Instruction Publique, à rassembler 'le plus grand nombre possible de ces organismes actifs par lesquels on se trouverait en liaison quotidienne avec les meilleurs éléments de la vie intellectuelle des grands pays, en particulier sur le terrain scientifique'." Pro-memoria, January 12, 1925, Archives nationales, 70AJ/146.

[69] A graduate of the Faculty of Law of Saint Petersburg, of which he later became a full professor, Pilenko (Александр Александрович Пиленко) first specialized in the field of patent law. After the Bolshevik coup, he left Russia first for Ukraine, then for France. He then joined the RAG and, for many years, gave a course in French on Soviet legislation within the Law section

(1873–1956) and Alexandre Lvovitch Baikoff[70] (1874–1943), both specialists in international law, in order to "*establish relations between the International Institute for Intellectual Cooperation and Russian academic organizations*".[71] This first contact took place even before the opening of the IIIC, which was officially inaugurated only on January 16, 1926.[72] In the absence of an answer, a second letter was sent a few weeks later to renew the request, and the RAG was ultimately able to count on the presence of its delegates Pilenko and Baikoff in the IIIC as soon as it began its work. To these was also added the presence of Pierre Struve[73] (1870–1944) as a member of the RAG representing the Union of Russian Academic Groups Abroad in Prague on the Commission for Intellectual Cooperation of the League of Nations. Thanks to these three delegates, the Group was able to initiate continuous relations with the League of Nations, which, though they had begun during the 1920s, had the greatest impact on the life of the RAG in the 1930s.

4.2 A Role of Consultant

In the second half of the 1920s, the RAG was forced to accept a new role. Once its reputation was well established, it was contacted to give its opinion on specific projects or people. The association assumed this academic character and the corresponding responsibilities, never hesitating to take a position and support it. The most striking example was a project for the creation of an International University in Davos, Switzerland. In June 1926, an article written by the physician Jenö Kollarits[74] (1870–1940) of the Budapest Faculty of Medicine appeared in the *Neue Zürcher Zeitung* (New Gazette of Zurich). In it, he presented the project for creating a university in a high mountain environment that would include all the faculties and

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of the Sorbonne. His numerous publications during the 1920s dealt mainly with Soviet law. See (Zarubinsky and Stavinsky, 1999).

[70] Baikoff (Александр Львович Байков) studied in the international law department of the University of Saint Petersburg. In 1914, he became a full professor of international law at the University of Moscow. Arrested in Moscow in August 1922, he was forced to leave Russia aboard the celebrated "boat of the philosophers" (see (Chamberlain, 2007)). Before finally settling in Paris, he lived in Berlin and Prague. As a member of the Law section founded by RAG, he taught a course in law theory. See (Volkov et al., 2006).

[71] Letter to Julien Luchaire, November 14, 1925, Archives nationales, 70AJ/146.

[72] File IIIC, Archives de l'UNESCO, available at https://atom.archives.unesco.org/international-institute-of-intellectual-co-operation.

[73] While studying law at the University of St. Petersburg, Struve (Пётр Бернгардович Струве) studied Marxist thought closely. He welcomed the revolution of February 1917, but, frightened by the Bolshevik coup, he enlisted in the army of volunteers of Alekseiev and Kornilov before going into exile in Sofia in November 1920. He then settled in Paris, where he became a member of the RAG. Struve was an important figure in Russian emigration; in 1926, he was notably at the origin of the 1926 Congress of Russian Emigration in Paris, the aim of which was to bring together representatives of the Russian diaspora to try to unite Russian political organizations. See (Frank, 1956).

[74] Kollarits was a Hungarian psychiatrist and neurologist, specializing in dyspraxia.

be conceived as a place where internationalism would be the rule, for the students as well as for the academics, in order actively to bring people together and favor international reconciliation. In addition to that, this university could allow students who had tuberculosis (an important problem at the beginning of the 20th century) to continue their studies in favorable climatic conditions.[75] A few months later, Kollaritz wrote to Antziferoff asking both for his opinion and for the opportunity to present his project to him in person. He specified, in particular, his desire to entrust the organization of this International University to a *Curatorium*, which would be directly linked to the League of Nations. He ended his letter with the following words:

> "I would be very grateful to you, Sir, for giving us your opinion on this project for the creation of an international university in Davos in general, and I would be happy to welcome any advice that may be suggested following your examination of the details of the project in particular, advice that I could relate *verbatim* with reference to your name, in the subsequent reworking of the questions mentioned in the present circular letter."[76]

This request came shortly after the RAG was brought together with the IIIC and, through it, with the League of Nations. One can see that the association's opinion had taken on a certain importance and that its role on the international scene had become manifest. Kollaritz saw potential support for his project in the association. In response to such a request, the RAG office decided to create a special committee to which all the professors present in Paris were invited. After studying the Kollaritz project, it delivered its conclusion:

> "The commission [..] concluded that the creation of an International University in Davos would be desirable. It fully shares your views, especially with regard to the formation of relationships - and consequently the possibility of rapprochement - between young people of different nationalities, in order to contribute by these means to a mutual understanding, which is very desirable among various peoples. The committee considers that the said University, being linked to the League of Nations, should be an autonomous and independent organization."[77]

[75] n. 986, June 18, 1926, "Nouvelle Gazette de Zurich", Archives nationales, 70AJ/149.

[76] "Je vous serais fort reconnaissant, Monsieur, de bien vouloir nous exposer votre opinion sur ce projet de création d'une université internationale à Davos en général, et m'estimerais heureux d'accueillir les conseils que pourrait vous suggérer l'examen des détails du projet en particulier, conseils que je pourrais rapporter textuellement avec référence de votre nom, dans le remaniement postérieur des questions faisant l'objet de la présente lettre circulaire." Letter from J. Kollaritz, September 23, 1926, Archives nationales, 70AJ/149.

[77] "Ladite commission [..] a conclu que la création d'une Université Internationale à Davos serait à souhaiter. Elle partage entièrement vos vues, surtout quant à la formation de relations—et par suite possibilité de rapprochement—entre les jeunes gens de nationalités différentes, afin de contribuer ainsi à une compréhension mutuelle, très désirable entre divers peuples. La commission considère que ladite Université étant liée à la Société des Nations, devrait être une organisation autonome et indépendante." Letter to J. Kollaritz, 18 November 1926, Archives nationales, 70AJ/149.

The RAG remained faithful to the internationalism that it had defended since its creation. A project like Kollaritz's was an obvious recipient of its support. The desire for independence for the projected institution is comparable to the one that the RAG itself organized, as we have seen. Furthermore, this future university could have been a privileged partner for the Group. In addition to that, the latter also saw the possibility of coming to the aid of students suffering from tuberculosis. The letter itself ends on this point:

> "Finally, the committee expressed the wish that Russian (emigrant) students suffering from tuberculosis should also be admitted to the University of Davos."[78]

In the project, the registration of students to this future university was reserved for nationals of the member countries of the LN. Each state could create, among other things, its own chair, the holder of which would teach in the national language, and its own boarding school. With this formula, the RAG ensured the interest of its members in this initiative. While a good number of Russian student emigrants in France had acquired French nationality, others retained a Russian nationality that the USSR no longer recognized. We can see that the RAG did not want to join a project of such magnitude without having the guarantee that each of its members could participate.

Despite a reminder from the Group two months later, Kollaritz did not respond for two years. On December 25, 1928, the disillusioned Hungarian physician informed the RAG of the failure of his project resulting from the fact that the IIIC did not want to sponsor an institution that had not yet been established. Somewhat bitter, he wrote:

> "It seems that this commission has taken the idea that I had to found a university myself and decided to see if it can take over the role of the great mentor in this institution. These blind people do not see that if a private man like me succeeds in accomplishing such a work, there would no longer be a need for a so-called 'intellectual' commission. So, for the moment, there is nothing can be accomplished with the kind of intellectuals who constitute this commission."[79]

Finally, the project initiated in the fall of 1926 was transformed into the institution of "*international graduate study holiday courses*",[80] which were inaugurated in

[78] "Enfin, la commission a émis le voeu que les étudiants russes (émigrés) atteints de tuberculose, soient eux-aussi admis à l'Université de Davos." Ibid.

[79] "Il semble que cette commission a pris l'idée que je devais fonder moi-même une université et ensuite elle verra si elle peut accepter de jouer le grand seigneur dans cette institution. Les aveugles ne voient pas que si un homme privé comme moi réussissait à accomplir une oeuvre pareille, il n'aurait plus besoin de la commission dite 'intellectuelle'. Il n'y a donc pour le moment rien à faire avec la sorte d'intellectuels qui fait partie de cette commission." Letter from J. Kollaritz to the RAG bureau, December 25, 1928, Archives nationales, 70AJ/149.

[80] Ibid.

March 1928. Even if the symbolic dimension seems to have been preserved there,[81] Kollarits could not have been satisfied with this decision. Nevertheless, he put those responsible for these international courses in contact with the RAG, but no action seems to have followed. Like their Hungarian colleague, the members of the RAG seem to have been disappointed with the failure of this ambitious project.

In the second part of the 1920s, the notoriety of the RAG reached, as can been seen, a higher level than during its first years of existence. It took advantage of the trust placed in it to consolidate its position as the academic representative of Russian emigration. This reputation went beyond Paris, spreading to the provinces, and even internationally. This aspect was particularly encouraged by the association. As we have already mentioned, some works by members of the RAG were selected by the "Carnegie Endowment for International Peace" and published in 1923. In 1927, other works were chosen to be published by Columbia University in New York. These articles dealt with political economy and international law, but none was devoted to mathematics.

However, the RAG did not remain inactive in this area. It officially participated in the International Congress of Mathematicians of 1928 in Bologna, then again in that of 1932 in Zurich. Basile Demtchenko, who had just presented his PhD,[82] was appointed as a delegate of the association in Bologna. There, he found his former Serbian teachers Petrovitch and Bilimovitch and presented a communication entitled "*On a generalization of integral invariants*" in which he resumed part of the work on analytical mechanics that he had studied in his PhD. In the proceedings of the congress, it is not surprising that Demtchenko was designated as one of the delegates from Russia[83] alongside the Soviet mathematicians Sergei Natanovich Bernstein[84] (1880–1968) and Nicolaï Mitrofanovitch Kryloff[85] (1879–1955), members of the Academy of Sciences of the USSR, and Nicolas Parfentieff (1877–1943) of the University of Kazan. In 1932, at the Zurich congress, Demtchenko again represented the RAG alongside Riabouchinsky and Savich. But, unlike at the Bologna Congress, the RAG was designated as an organization under the French State. The reason for the modification is not clear, but one may wonder if the RAG, in 1928, had not insisted on appearing as an organization that could legitimately represent Russian scholars, a legitimacy that could only diminish over time with normalization of relations with the USSR. In the absence of additional documentation, it is difficult to confirm this assumption.

During these two international congresses, the RAG nevertheless had the opportunity to officially appear on the world mathematical scene. Its position as an official

[81] These courses were occasion for large gatherings of various European personalities. The German philosopher Hans Driesch (1867–1941) and the French sociologist Lucien Lévy-Bruhl (1857–1939) gave two speeches during the inauguration of the courses. See (Grandjean, 2011).

[82] Extrait des comptes rendus des cours faits par les professeurs russes près la faculté des sciences, années scolaire 1927–1928, Archives nationales, 70AJ/157.

[83] Tomo I, Rendiconto del Congresso Conferenze, 1928, p. 32.

[84] Сергей Натанович Бернштейн.

[85] Николай Митрофанович Крылов.

academic representative was clearly displayed and a certain scientific legitimacy emerged from it.

In 1929, a modification of the RAG statutes was determined to better reflect the evolution of its missions since 1920. A new objective was notably added: *"establish relations between Russian scientists and foreign companies and establishments"*.[86] It emphasized the group's intention to continue its expansion on the international scene, in particular through participation in numerous congresses.

5 Conclusion

The Russian emigration in France during the 1920s benefited from a remarkable impulse towards self-organization. The creation of mutual aid associations that aimed to bring together members of the intelligentsia in exile made it possible to maintain a continuity of scientific research despite an a priori unfavorable context. In the study (Mazliak and Perfettini, 2021) that we conducted on mathematicians, we proposed a typology of classification of scientific emigrants according to the personal situations in which they found themselves at the time of their exile.

The problem of transmission between generations was a point often put forward by the RAG. Several actions were carried out for the benefit of students, particularly the institution of grants supported by the French government. Active academics often received a warm welcome from French intellectuals who supported and accompanied them in the pursuit of their research. If the French administration could only rarely offer an official academic position to Russian mathematicians,[87] its role was decisive within the Russian community, in particular, through the Russian sections set up by the RAG.

The Russian Academic Group in Paris was not the only mutual aid association at the academic level. For students specifically, we can cite, among others, the Patronage Committee of Russian youth abroad, whose role and activities are detailed in (Nicolas, 2004), the Union of Russian Students in France, the National Union of Russian Students and the Ladies' Committee for Student Aid. Professional associations were also numerous. Further specific studies on these institutions would be welcome in order to foster a better understanding of the constellation of associations that reflects the remarkable wealth of intellectual activity within the Russian community in France during the 1920s.

[86] Modifications aux statuts du Groupe Académique Russe à Paris, November 12, 1929, Archives nationales, 70AJ/146.

[87] Fontanon explains in (Fontanon, 2007) that Riabouchinsky, thanks, in particular, to Painlevé's intervention, was quickly appointed to the very new chair in fluid mechanics at the University of Paris just a few years after his installation in France. He is nonetheless one of the rare Russian mathematicians to have occupied an official academic position so quickly.

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The Roads of Russian Emigrant Zoologists

Sergei I. Fokin

Abstract

The fates of zoologists who left Russia after 1917 are discussed. Although their stories are quite different, many of the people mentioned managed to remain in the profession and even make a significant contribution to science whilst working in the West. The waves of post-revolutionary emigration spread throughout the world. Initially, scientists sought to settle in countries like France, Germany, the Balkans, Czechoslovakia, England and the USA, where they would have an opportunity to continue their scientific studies. Among the heroes of the article, there are both young scientists, who were about 25–30 years old at the time of the revolution, and well-established zoologists, as well as doctors of science and professors who were around 45–55 years old. The study of the biographies of 15 Russian emigrant zoologists allows us to discern several different options that lay ahead for them abroad: (1) Successful integration, as a result of having already made names for themselves during their Russian periods. (2) Creation of a significant name within the scientific community from nothing only after emigration. (3) Existence within the western scientific community, but without any possibility of a significant career. (4) Change of profession due to the inability to apply their zoological knowledge under the circumstances of emigration. Not all of them were able to realize the goal of being a scientist in the West, but in Soviet Russia, most of them would not have had any future at all. Russia lost them, but the world gained them.

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Russian zoologists · Scientific biographies · Russian scientific emigration · Twentieth century · Post 1917 Revolution period · Intellectual diaspora

1 Introduction

In the history of Russian culture, the beginning of the 20th century is usually referred to as the "Silver Age". The late 19th and the first two decades of the 20th century witnessed a remarkable flourishing of intellectual endeavours in Russia, including the most diverse areas of human activity. Though the name "Silver Age" is usually applied to Russian literature and art, science, as an integral part of the culture, also falls under this elegant definition. The most characteristic feature of this period was the remarkable constellation of personalities. This applies perfectly to the Russian zoological community of that period.

Unfortunately, the seizure of power by the Bolsheviks in October 1917 brought about dramatic changes in every sphere of life; in fact, the most intellectually active, cultural members of society - nobles, landlords, industrialists, scientists, ecclesiastical figures and army officers - were outlawed.

Tens of thousands of people in Russia, immediately after the revolution or a few years later, were faced with the choice of either fighting the established regime or leaving it behind, and more often than not, they decided to flee the country. This was a crucial question for scientists as well. Of course, Russian science was greatly undermined by the emigration and deportation of many excellent specialists in all spheres of knowledge. More than 1000 native scientists were forced abroad after 1917, among whom were several dozen zoologists, although this is a rough calculation indeed (Kowalevsky 1971; Raev 1994; Kolchinsky 2003; Fokin 2005, 2015a). "*I congratulate you on the New Year and wish you all the best*," wrote academician-zoologist V. V. Zalensky from Sevastopolto Petrograd at the very beginning of 1918:

> "I know, it's mere congratulations, and that, I, for one, am not currently anticipating anything good. I am wracked with despair over the unsightly abomination for which I see no definitive end. No light shines for Russia at all. <…>. Hardly anyone now seems interested in the fate of a man who has worked his whole life with his brains, not calloused hands. The latter are now greatly preferred. If this continues, we will turn into a herd of dray horses".[1]

After the official beginning of the "Red terror" (RSFSR government ruling of 05.09.1918), it became clear to many that this was not just a case of hardship due to life under the new power (in the major cities of the European section of Russia, the situation became nearly catastrophic as early as 1916–1917), but that the

[1]Russian Governmental Historical Archive. St. Petersburg. Fd. 1129. D.1. F. 110. P. 9.

Bolsheviks were deliberately pursuing a policy of fighting those they perceived as "class enemies", among whom most representatives of the cultural milieu of the country were automatically counted. Moreover, the violence increasingly resulted in the direct killing not only of those who actively disagreed with the essence and methods of the established regime, but even of those who were suspected of such disagreement.

The heroes of this article were "fortunate", as they escaped Soviet Russia with their lives, and often their loved ones. However, as the reader will see further on, not all of them were able to remain scientists outside of Russia, for reasons of both an objective and subjective nature.

The heroes of this article are zoologists (I have checked and/or reconstructed the life stories of 15 people), who, in 1917–1920, were 25–55 years old. I will be covering eleven specific cases, most of whom both studied and worked in the discipline in St. Petersburg. These were people who found their way out of Russia by very different means. For example, K. N. Davidoff (1877–1960) left Petrograd[2] on foot for Finland in the winter of 1922; B. Ph. Sokolov (1889–1979) traveled to Estonia by train, using false documents to pass himself off as a native of that land (1921); S. S. Chakhotin (1883–1973) fled by sea from Novorossiysk to Istanbul (1919); M. M. Novikoff (1876–1965) was sent away from Leningrad to Germany on the first "Philosophical steamer" (1922); C. A. Hoar (1892–1984) left Russia on a scientific business trip and simply never returned (1920); B. P. Uvarov (1886–1970) and V. M. Shitz (1886–1958), both living and working abroad, the former in Georgia and the latter in France, found themselves, despite their intention of returning to Russia, essentially in exile in those foreign lands at the end of 1917. However, by 1923, all of the heroes of this article were in the West. And it was there—in England, France, Switzerland, Serbia, Czechoslovakia and the United States—that almost all of them ended up spending, if not the rest of their lives, then very close to it. Their fates represent the full spectrum of a possible scientific career in emigration[3]—ranging from great success to complete failure (Fokin 2015a, 2018).

Waves of Russian emigration have spilled out around the world throughout history, but never more so than after the Revolution and the Civil War, when people left for France, Germany, the Czechoslovak Republic and the Balkans. The Kingdom of Serbia, Croatia and Slovenia alone (from 1929—the Kingdom of Yugoslavia) accepted about 70,000 Russian refugees from the spring of 1919 up to the beginning of 1923. More than 40,000 of these emigrants remained there for a long time, some even permanently (Kowalevsky, 1971; Sibinovitch, 1996).

[2]Up until 1914, it was known as St. Petersburg, and then, in 1924, the city was renamed Leningrad.

[3]The rest of my heroes: Th. G. Dobrzhansky (1900–1975); D. Ph. Sinitzin (1871–1937); N. J. Wagner (1893–1953) and S. Ph. Koncek (1890?–1941) show the same variation in scientific careers fostered under emigration – from great success (Dobrzhansky) to complete failure (Koncek).

2 The Destinies of the Emigrant Zoologists Under Study

Juliy Nikolaevitch Wagner (1865–1946),[4] zoologist, entomologist, and parasitologist, specialized in invertebrate zoology at St. Petersburg's Imperial University (ISPbU) under the supervision of *Privatdocent* C. S. Merezhkovsky. In 1898, Wagner was appointed a professor at Kiev Polytechnical Institute, and after emigration, he settled at Belgrade University (1920). There, he became a well-known scientist in the field of entomology (Fokin, 2009) (Fig. 1).

The civil war that started in Ukraine in 1918 dramatically changed his life. After the liberation of Ukraine from Russia at the beginning of 1918, he became quite a well-known political figure in Kiev. In the spring of 1918, Wagner was invited to take up a position in the government led by P. P. Skoropadsky. In this government, Wagner became the Minister of Labour. Juliy Nikolaevitch was a fierce opponent of Soviet power and, in October 1918, signed the "Address of Ten" to the Prime minister, Ph. A. Lizogub, in protest against the establishment of any connection

Fig. 1 J. N. Wagner, Belgrade, 1931

[4]There are some contradictions in terms of the date of his death – 1945 has also been mentioned as a possibility.

between Ukraine and Soviet Russia. As a result of this, in November 1919, before the Bolsheviks came to power, he had to flee from Kiev for the “White” South in order to save his life. After a long and dangerous trip by train to Odessa, normally a three-day journey that ended up taking more than a month, he spent a couple of months there devoting all of his time to finding a way to get abroad. He finally succeeded in doing so, leaving from Novorossiysk via Istanbul-Salonika by steamer, then heading for Serbia through Macedonia by train. In spring of 1920, Wagner obtained a professorship of zoology in the Agricultural Faculty of Belgrade University and simultaneously started to teach natural science in the gymnasium (1920–1934).

After two years, Prof. Wagner described the situation at the University in his letter to his former student Prof. M. N. Rimskiy-Korsakov as follows:

> “All professors who arrived here in this way or another were accommodated. The majority got chairs. There are seven Russian professors on our Agronomy faculty now<…> . For a long time, Russians were not accepted by the Medical faculty, but the shortage of their own specialists pushed them to resort to Russian help. The smallest number of Russian professors is at the Theological Faculty, the highest at the Agronomy and Technical ones <...>. The salary here is not high, so a man with a family needs an additional job. The craft workers are in a better position in comparison to the officials, as manual labour is more valued here. Some of the typesetters can earn more than a university professor or a teacher in the gymnasium. The simple unskilled worker is getting the same salary as an assistant <...>. My salary is quite sufficient. I also teach in a gymnasium. In fact, my financial situation is such that I do not need more; I can even help others. It is, of course, impossible to make a comparison between your conditions and those in Serbia. The situation is worse [?] here in regard to “spiritual food”. The country is lacking in culture. Good libraries do not exist, everything necessary for scientific work – from the tools to simple glass jars and general chemicals - has to be imported from abroad. There is absolutely no essential scientific literature. For example, there are no available books on entomology, not even one of the popular ones; keys for the discrimination of insects do not exist<...>. The situation, simply put, is the same as we probably had at the beginning of the sixties (XIX c. – S. F.) <...>. I guess it is our obligation not to leave the country before we produce the necessary textbooks and other guidance for our specialty. We also have to do this in gratitude for the hospitality that was provided for us here”.[5]

Prof. Wagner managed to do just that. After a short time, in 1923, in a basement of the laboratory he created (which, at the beginning, occupied just two rooms), the Entomological Institute of Belgrade University was founded. In the years 1925–1926, Wagner’s main efforts were aimed at organization of the Entomological Society and its journal in the Kingdom of Serbia, Croatia and Slovenia. In May 1926, the first local Entomological Congress, organized by a group of Serbian scientists, with Prof. Wagner as a chief, took place in Belgrade. He had published several textbooks on entomology. Wagner’s large review on the flea fauna (his main entomological subject) of Middle Europe was published at the end of 1935 in Germany.

[5] St. Petersburg branch of the Archive of Russian Academy of Science (PBA RAS). Fd. 902. D. 2. F. 89. P. 1–4.

Wagner never supported the Soviet system, and when the Soviet army entered Yugoslavia (1944) during World War II, he escaped to Austria. According to his granddaughter, the scientist died somewhere in Austria at the beginning of 1946.[6] However, according to the materials published in the data directory "Unforgettable Graves", Juliy Nikolaevitch died on April 4, 1945.[7] The location of Wagner's grave, as well as that of his archive (if it exists), is still unknown.

One of the scientific institutions in the West in which Russian emigrants took an active part after 1917 was the Pasteur Institute in Paris, France, including in its branches in different countries. This is quite understandable, as, since 1888, when Prof. I. I. Mechnikov[8] had established himself there, scientists-biologists from Russia had consistently worked at the institute. In fact, there was more Russian emigration to France than any other country.

Sergei Ivanovitch Metalnikov (1870–1946), zoologist, physiologist and immunologist (Fig. 2). He specialized in invertebrate zoology at ISPbU under the supervision of Prof. W. T. Schewiakoff. Metalnikov earned his Ph.D. in zoology (1908), and became the head of the Biological Laboratory in St. Petersburg, as well as a deputy director of the Higher Lesgaft Courses (1909). In a short time, he was also selected for a professorship in zoology for the St. Petersburg Higher Women's Courses (1911). Before 1917, Sergei Ivanovitch was already a well-known figure within the Russian scientific community (Fokin 2011, 2012, 2015a).

In the summer of 1917, Sergei Ivanovitch wrote to his friend, Prof. Yu. A. Filipchenko:

> "Of course, I have too many ties with St. Petersburg and the Biological Laboratory, and I do not know whether I will be able to break these ties <...>. The fact is that my financial affairs under the new republican or even socialist regime can change significantly, and actually, have already changed<...> . I may even go to America, to the Rockefeller Institute, where I could continue my work on tuberculosis. And that's what I'm thinking. If Nahimkis and Trotsky reign in Russia instead of Nicholas II, then we'll probably have to emigrate somewhere. Kronstadt[9] showed us what we can expect from the Councils of Working Deputies, under the power of the likes of Rahya, Lunacharsky, Lenin, etc."[10]

In November 1917, immediately after the Bolshevik's coup d'état, Metalnikov left St. Petersburg (Petrograd) for the Crimea, where he had a large estate, "Artek", near the Ayu-Dag mountain. He was never to return to St. Petersburg. In 1919, Metalnikov, together with his family, went to Paris via Istanbul and Varna. In Paris,

[6]Records of the author's conversation with V. N. Wagner. Moscow, June 2007. Author's archive.
[7]However, it is quite probable that this date of death refers to that of his son, Or.
[8]Ilya I. Mechnikov (1845–1916), Russian zoologist, embryologist and immunologist. In 1908, he was awarded the Nobel Prize. Mechnikov played a very important role in the Pasteur Institute. His laboratory hosted many Russian scientists who were to become his disciples.
[9]At the beginning of March 1917, about 200 navy officers were killed; Admiral of the Fleet A. I. Nepenin was killed at the same time in Gelsingfors (Helsinki). Four years later, an armed revolt took place in Kronstadt's navy garrison against the Communists; it lasted a couple of weeks (01.03.1921–17.03.1921) before it was suppressed, with about 4000 people ultimately being killed.
[10]Manuscripts division of the Russian National Library (MD RNL). Fd. 813. D. 421. P. 56. In the letter he mentioned names of several Bolsheviks, well-know at that time.

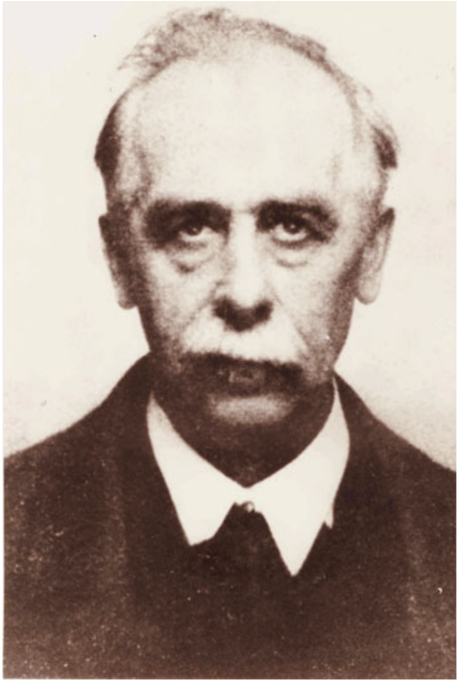

Fig. 2 S. I. Metalnikov. Paris. 1940?

he was invited by Prof. E. Roux, director of the Pasteur Institute, to be the head of a laboratory. His career in the West was exceptional; many other emigrant zoologists fared less well.

During the French period of his life, Prof. Metalnikov contributed to the development of psychoneuroimmunology. He investigated immunity in invertebrates (mainly insects), studied connections between the immune and nervous systems, and elaborated biological methods of pest control. He published extensively in all his fields of research. In the last years of his life, Prof. Metalnikov became increasingly concerned with the problems of evolution, immortality, and the laboratory selection of bacteria that can kill insects that are harmful to agricultural plants. Among his last important publications were *Fighting against death* (1937) and *Role of psychic factors in evolution* (1940).

Metalnikov was undoubtedly a prominent scientist. He published some 250 scientific works, mostly in the fields of the comparative physiology of invertebrates, applied microbiology, and immunology. Some of his studies opened new areas of research, which (in the case of applied microbiology) had great potential in terms of their possible industrial and agricultural applications. Before WWII, his research in the field of applied microbiology was favorably received in Germany and America, and Metalnikov's experiments in agriculture were extended to several European countries, like France, Yugoslavia, Poland, and Switzerland, as well as to Algeria and to California in the US.

While in France, he took an active part in the affairs of Russian organizations: the Russian People's University in Paris and the National Association, an academic group. Unfortunately, in the early days of WWII, Metalnikov's laboratory was closed and he was forced to retire. Wartime shortages and the impossibility of continuing his research proved very stressful for him. In the summer of 1942, Prof. Metalnikov had a nervous breakdown, and he was later admitted to a special hospital in Medon, where he died on September 27, 1946. He was buried at the Sainte-Geneviève-des-Bois cemetery near Paris.

In the late 20th century, the study of antimicrobial peptides that are involved in the immune response of insects was continued at St. Petersburg University—Metalnikov's *alma mater*. In order to commemorate Prof. Metalnikov as the man who had discovered the humoral immunity of insects, one family of these peptides was named in his honor — metalnikovins (Chernysh et al. 1996). The International Society for Neuroimmunomodulation also established the Metalnikov medal (1993) as a tribute.

Konstantin Nikolaevitch Davydov (1878–1960), zoologist, embryologist and faunist (Fig. 3). He specialized in invertebrate zoology at ISPbU under the supervision of Prof. W. T. Schewiakoff (Fokin 2012). Davydov earned his Ph.D. thesis at Moscow University (1909). The data on regeneration in the nemertine *Lineus lacteus* became the basis of Davydov's Dr.Sc thesis, defended as a monograph (1915). As a *Privatdocent* at Petrograd University, he lectured on comparative

Fig. 3 K. N. Davydov. Paris, 1947. The first publication

embryology. Before 1917, Konstantin Nikolaevitch was already a well-known figure within the Russian scientific community.

In 1918, he was elected as professor of zoology at Perm University. The difficult military and economical situation in Permduring the Civil war (1918–1920) led Davydov to relocate to Petrograd. There, he worked in the Biological Laboratory of the Lesshaft Institute of Natural Sciences. In 1922, Davydov secretly left Russia, first arriving in Finland and then going on to France. The main reason for Prof. Davydov's emigration was apparently the hope of starting a new personal life with his companion, A. U. Verezhagina (1894–1964). They found it in Paris, in 1923, and he was never to return to Russia.

Davydov's career abroad was developed mostly in France. There, he worked in the laboratories of M. Caullery (Paris) and O. Duboscq (Banyuls-sur-Mer). He published *A Manual in Comparative Embryology of Invertebrates* (1928), which brought him world-wide fame. He also worked at the Naples Zoological Station in 1927. This study was supported by a Rockefeller Foundation grant.

Twice, Davydov worked in Indo-China for extended periods (1929–1934 and 1938–1939), primarily at the Institute of Oceanography in Cauda, close to Nya-Tanga. The results of Davydov's investigations in Indo-China were truly colossal. He described more than 140 species of sponge, more than 500 species of coelenterate, and almost 100 species of bryozoan. In particular, he found 10 species of *Ctenoplana*, which are extremely rare crawling ctenophores. Hundreds of other invertebrates were recorded by Davydov in that region for the first time; indeed, he made more systematic discoveries of fauna than all of the other zoologists who had worked in Indo-China in the preceding 25 years.

At the beginning of WWII, Davydov was appointed as a supervisor at the National Center of Scientific Research of France. In 1949, the Paris Academy elected him as a corresponding member. In the 1940s and 1950s, in addition to processing his tropical collections, Davydov prepared treatises on the basis of his long-term investigations. They were published in the *Traité de Zoologie* (1948–1959): *Echinoderm Embryology*, *The Phylum Stomochordata*, *Embryonic Development of Arachnida*, *Class Phoronida* and *Class Echiura*.

In the last decade of his life, Davydov actively corresponded with Russian colleagues and friends. However, he was not to visit his native country again. Prof. K. N. Davydov died after a stroke on June 21, 1960. He was buried at the Sainte-Geneviève-des-Bois cemetery near Paris.

Sergei Stepanovitch Chakhotin (1883–1973), biophysicist and experimental cell biologist, graduate of Heidelberg University, where he studied zoology (1904–1907) under the supervision of Prof. O. Bütschli (Fig. 4). He was a fairly successful and well-known emigrant-biologist in France. However, he lived there only from 1934 to 1954.[11] He is one of the few among my heroes who actively participated in the White Movement (1918–1919), though not as a combatant.[12] However, he left

[11]Before going on to work in Slovenia, Italy, Germany and Denmark.

[12]S. S. Chakhotin was a chief of the Information section in the Voluntary White army in southern Russia (Ekaterinodar, Rostov).

Fig. 4 S. S. Chakhotin. Paris, 1936

Russia for Europe in spring of 1919, long before the Bolsheviks won the Civil War, and repeatedly changed his fields of work in the West, as he was not exclusively engaged in science.

Chakhotin made a dramatic turn in his political views in 1920, having taken on the position of the "Change of milestones" emigrants' movement. His widely known article *To Kanossa* (1921) was positively welcomed by the Bolsheviks, and was specifically noted by Lenin.

The sheer variety of his hobbies and talents, maybe too numerous, has led Chakhotin to be remembered now more as a man who lived an amazing life than as a major scientist, politician, writer, one of the first Russian esperantists, artist or peace activist. Maybe if he had focused on science, the results would have been more fundamental. Who knows? Chakhotin chose the life he lived.

Prof. Chakhotin (although he did not receive a Ph.D. degree, not even having passed his Ph.D. examinations, and therefore could not formally hold a professorship) is the only hero in this paper who returned to the USSR,[13] but this does not seem to have brought him the expected satisfaction. After lengthy negotiations with USSR government officials, lasting several years, he was able to return to his homeland in 1958. There, he worked in scientific biological institutions, first in Leningrad, and then in Moscow. His last years in the USSR probably did not work out as he had hoped they would.

[13]He got his Dr.Sc degree in Russia (1960) without discussion of a thesis, as a sign of his scientific achievements.

It is worth mentioning Chakhotin's main technical invention as a scientist—an apparatus for local ultraviolet irradiation of living micro-objects, created in Germany before his emigration (Heidelberg, 1912). By the middle of 1960, a system developed by Carl Zeiss in Jena, based on Chakhotin's instrument, was being used. Sergei Stepanovitch's idea was a modern microscopic installation with mirror-lens lenses, which was allowed to "operate" on microscopic cell organelles. The use of "Chakhotin's method," was taken up in the last quarter of the 20th century and made it possible to solve or at least address several problems concerning cell biology and physiology.

Victor Michailovitch Shitz (1886–1958), zoologist, comparative histologist-anatomist (Fig. 5). He studied invertebrate zoology at ISPbU under the supervision of Prof. W. T. Schewiakoff. Shitz graduated from the University with a first-degree diploma in 1910, and was subsequently attached to the Special Zoological Laboratory of the Academy of Sciences. As a Ph.D. student of ISPbU (1912–1915), he made for a promising young scientist. Shitz worked at two Mediterranean marine zoological stations: one at Villafranca and one at Naples (1911–1914). His investigations there were devoted to spermatogenesis in pteropods and other gastropod molluscs. They were to form the basis of his Ph.D. thesis, which,

Fig. 5 V. M. Shitz. Bern, 1936. Self-portrait

unfortunately, was never completed. However, he published more than 10 scientific and science-popular papers, as well as the Russian translation of Prof. A. Weismann's lectures on the evolutionary theory (1918).

In 1913, Shitz had already passed his Ph.D. exams and was elected as an assistant at the University of Perm in the fall of 1916, but he was simultaneously drafted into the army. Victor Michailovitch worked in the Artillery Commission of Count P. N. Ignatiev in Paris as a military official. The commission continued to exist after the revolution until 1919, even after Russia's withdrawal from the war in 1918.

The circumstances of his life prevented Shitz from continuing his scientific research, even though he had studied chemistry and microbiology in Lyon and Bern (1919–1922). His attempts to return to Russia failed. Soviet officials refused Shitz's citizenship, although he had never technically lost it, since he was not an emigrant.

In Bern, Shitz suddenly discovered his artistic abilities. After attending a local special school and classes with a painter in Paris, drawing became his main professional activity. From 1925 until the end of his life, he earned his living by drawing murals for the University, schools, and other educational establishments. Shitz did a lot for the popularisation of Russian culture in Bern, often lecturing on his homeland (*N. A. Rimskiy-Korsakov, his life and art*, *Tchaikovsky*, *St. Petersburg-Leningrad*, *Pushkin's day*). During WWII and immediately after, interest in Russia was very high in Switzerland, and lectures given by an actual Russian enjoyed enormous success among Bern's residents.

Not long before his death, Victor Michailovitch wrote to one of his fellow university students, Prof. A. A. Lubischev:

> "So, my whole life has passed in the ridiculous anticipation of something that never will come true. Eternal running in place. Eternal pursuit of earnings! I became a good "table-maker", an average artist and a bad writer (from time to time I write articles for the local newspapers). In short, life has passed here in vain, in endless anticipation <...>. I certainly did not taste the charms of the Socialist world, but the Capitalist paradise I tasted, quite, strictly speaking, was full of them <...>. Looking back, I will say that "good impulses are destined for us, but there is nothing we can do". It's not my fault, though! My whole life was a struggle for existence, a tense, brutal struggle that prevented me from realizing my ideals".[14]

V. M. Shitz died in March 1958. His life story is, in a way, quite typical for the Russian Diasporas of the 1920s and 1930s. So many talented people found themselves outside of Russia after 1917, and a number of them failed to fulfil their professional ambitions.

Mikhail Mikhailovitch Novikov (1876–1965), zoologist, comparative anatomist, historian of science (Fig. 6). Novikov studied zoology at Heidelberg University (1900–1904) under the supervision of Prof. O. Bütschli. All of his further achievements as a zoologist, and there were quite a few, are related to the field of comparative anatomy and histology of mainly invertebrate animals. In 1909, he earned a Ph.D. and, in 1911, a Dr.Sc degree in zoology. However, Mikhail

[14]PBA RAS. Fd. 1033. D. 3. F. 479. P. 2–9.

Fig. 6 M. M. Novikov. Prague, middle of the 1930s

Mikhailovitch's rich and proactive nature required a public manifestation: in 1908, Novikov was elected as a public representative of the Moscow City Duma, where he worked for 10 years. By then, he had already become a notable figure in the party of constitutional democrats (cadets), which was sympathetic to the majority of Russian professors.

After October 1917, he became Dean of the Faculty of Physics and Mathematics (1918), and in March of the following year, he was elected Rector (the last elected Rector!) of Moscow University. Starting in the summer of 1919, Novikov was also Chairman of the Scientific Commission within the Scientific and Technical Department of RSFSR.

He entered the political and revolutionary movement in Moscow as a constitutional democrat. As a result, he was expelled from Russiain 1922. "*My life in my homeland, dedicated to science and Russia, has ended*," Novikov wrote about these days. "*A new life began as a foreigner, which was often marked by all kinds of sorrows and difficulties common to refugees. But I also tried to fill and revive it with scientific work and service to the Russian people*" (Novikov 1952, p. 328).

The following year, he came to Prague within the scope of the so-called "Russian action". For 16 years, he served as the rector of the Russian Free University in Prague. Aside from this academic function, he also dedicated himself to scientific research, as well as to several other organizational activities. In the early 1920s, Czechoslovakia was in the second place after France with respect to the number of Russian natural scientists residing there permanently. Novikov managed to open and manage his own *Russian zoological seminar* at the Zoological Institute at the Czech Charles University in Prague. In the years 1923 to 1925, the Institute, for a transitory period, served to maintain the continuity of the academic research of about twenty Russian zoology specialists (Hermann and Kleisner 2005).

Prof. Novikov belonged to the most influential and important group of emigrants, both due to the extent of his own scientific work and the importance of his cultural and academic organizational activities.

He was engaged as a professor at Charles University (1927–1939). During WWII, he worked at the Slovak University (Bratislava), where he founded the discipline of zoology (1939–1945). After the war, he moved to Munich to participate in establishing the Refugee University at UNRRA[15] (1945–1947), simultaneously working as a professor at the local university.

Fearing forced repatriation to Soviet Russia and living under very constrained economic conditions, in August 1949, at the age of 73, Novikov moved with his family to the United States, specifically New York. There, he developed a project to create the Russian Free University, named after Lomonosov, with the aim of uniting immigrant scientists (the project remained unrealized), led the Russian Academic Group, participated in the activities of the Pyrogov Society, and delivered public lectures. His autobiography and works dedicated to Russian natural scientists, Russian emigration in Prague and his teacher, Prof. Otto Bütschli, were all published in the United States. M. M. Novikov died on January 12, 1965, at the age 89 in Nyack, near New York City. He lived a difficult, but probably happy life;—most emigrants were not fortunate enough to meet with such a favourable fate.

Boris Petrovitch Uvarov (1886–1970), entomologist-zoologist (Fig. 7). He graduated from ISPbU (1910), where he studied zoology under the supervision of Prof. W. T. Schewiakoff. Boris Petrovitch definitely became one of the most famous among Russian emigrant zoologists. His name is well known, above all, to entomologists and ecologists. It was he who determined that flying locusts that had long been causing huge amounts of damage to agriculture had developed from the eggs of single cobbles if, under certain conditions, the population density of these insects exceeded the critical threshold. Before Uvarov's studies, these two forms were considered close species, differing from each other in structure and behavior. This seemingly niche discovery is now known as the phenomenon of phase in locust development, and became an important contribution to our understanding of the population dynamics of locusts, as well as laying the scientific foundations for monitoring and controlling the number of these dangerous pests, enabling the definition of a strategy for combatting this perennial enemy of cultural plants in the arid regions of our planet (Fokin and Shergalin 2019).

In 1915, after moving to Tiflis (Tbilisi), Boris Petrovitch became a senior specialist in applied entomology at the local farming department. He also worked at the museum and university there. During the revolution in Russia, he also lived in Georgia. In 1920, his first book, *Agricultural Entomology*, was published there. Thus, Uvarov was already abroad before leaving for the West.[16]

In the spring of 1920, he accepted an offer from English colleagues and, in the summer, moved with his family to the United Kingdom (UK), specifically London (Fokin and Shergalin 2019), where his international career began from scratch, first

[15]United Nations Relief and Rehabilitation Administration.

[16]At that time, Georgia was an independent country.

Fig. 7 B. P. Uvarov. London, middle of the 1950s

at the Imperial Bureau of Entomology,[17] and then mainly at the British Museum, on the basis of which he established the *Anti-locust Research Center*. He remained in the Bureau until 1945, first under G. A. K. Marshall (later Sir Guy Marshall), and subsequently under S. A. Neave. His official work at the Bureau involved the identification of insects sent in from all parts of the Commonwealth, but he also found time to add to his already large output of papers on the taxonomy of grasshoppers; in was in this time that he wrote his classic book *Locusts and grasshoppers* (1928), which was published in English and Russian and became the bible of "acridologists" (Wigglesworth 1971, p. 714).

In 1928, Uvarov wrote to one of his Russian colleagues, his former teacher Prof. N. Y. Kuznetcov:

> "You're wondering how my affairs and moods are. Things flow in a measured order, and days and weeks only flicker one after another, and afterwards they form years: for it is 8 years since I came here. It is impossible to complain about the situation and conditions of work—I always aspired to working in a large Museum and now I find myself in the largest one that exists. However, man is not happy with anything, and sometimes there is an unquestionable tendency to whine. The main reason – there is a lot of boredom in life and work in English conditions: everything flows calmly and precisely, there are no big problems, no bright joys. In the work I am very oppressed by the fact that I feel isolated—no one among the entomologists here shows wide interests, outside work they are not even

[17]The Imperial Bureau (later Commonwealth Institute) of Entomology, UK.

> interested in their own work. There's no one to talk to and argue about different general topics… In short, it is possible to sum up: one can live and work well, but sometimes it is nauseatingly boring. As a result, I notice with fear how gradually the light of enthusiasm for work, without which sometimes the soul becomes empty, goes off. Probably, it is simply isolation from the motherland, but it is pointless talking about it—it is necessary, one way or another, to live here".[18]

A year earlier (September 1, 1927), Uvarov had received a letter from N. I. Vavilov in which the future Soviet academician (1929) persuaded Boris Nikolaevitch to come back to Russia to work "for the good of Soviet science". Uvarov had strongly negative feelings about the new Russian reality (Fokin and Shergalin 2019), and thus he rejected the invitation and, in doing so, showed much better judgment than Vavilov.[19]

The Anti-Locust Research Centre has continued to operate since 1945 under the auspices of OON. B. P. Uvarov's contributions to the international community were marked by the orders of Mikhail and George (UK), the Honorary Legion (France) and Lion (Belgium). He was elected as a Fellow of the Royal Society—Academician (1950) and received a knighthood in England. From 1959 to 1961, Sir Boris Petrovitch headed the Royal Entomological Society of London, and was an honorary member of similar organizations in France, Egypt, India, Russia and other countries. More than 80 species and 11 genera of straight-wing insect have been named after him. Throughout his life in the UK, he kept up a constant correspondence with his colleagues from Russia and helped them as much as he could—by sending books, magazines, or even food parcels (in the early 1920s).

In 1968, during the 13th International Entomological Congress, he managed to visit his homeland. In Moscow, Uvarov gave a report entitled *Present and future problems of acridology*. However, his attempt to visit his native land in Kazakhstan did not end well: in Nukus, as a foreigner who did not have a special permit, he was only allowed to step off of the plane, so the "taste of the fatherland" turned out to be bitter. Prof. A. A. Lubischev, who had known Uvarov for sixty years, finished his memories about him: "*In all his activities he lived a life worthy of emulation, and I do not know of a single stain on his moral character*".[20]

Cecil Arthur Hoar (1892–1984), zoologist-protistologist (Fig. 8). Hoar's life story differed from that of other zoologists who left Russia. Cecil's father, the journalist Arthur Stowell Hoare, was an Englishman, and his mother, a Russian citizen named Amalia Chalet (Aimee Shalet), was a singer who had studied her craft at the Kiev Conservatory. C. A. Hoar was born in Holland, and had a dual (English-Russian) citizenship, but he had lived with his mother in St. Petersburg from the age of six.

[18]PBA RAS. Fd. 793. D. 2. F. 708. P 24.

[19]N. I. Vavilov (1887–1943), Russian and Soviet geneticist, botanist, breeder, public figure and statesman. On the basis of fabricated charges, he was arrested in 1940; in 1941, he was convicted and sentenced to death by firing squad, a judgment that was subsequently commuted to 20-year sentence. He died in prison.

[20]PBA RAS. Fd. 1033. D. 3. F. 506. P. 9.

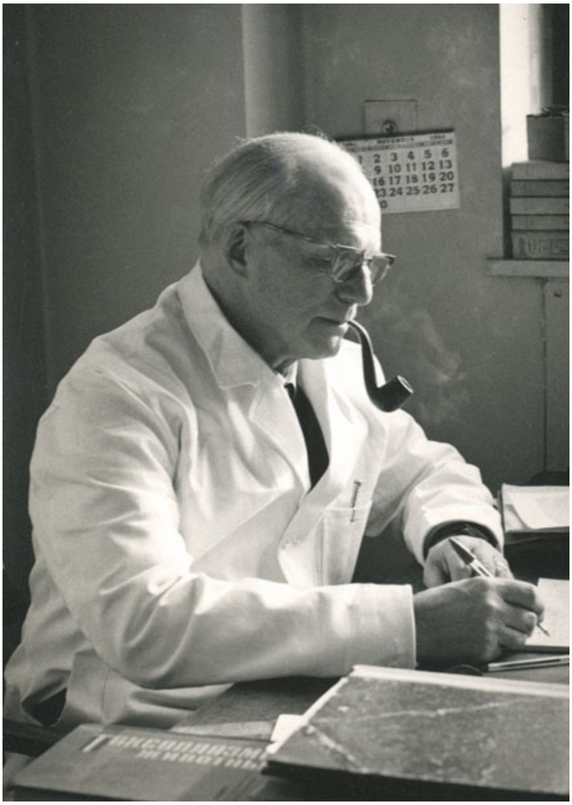

Fig. 8 C. A. Hoar. London, 1965

He graduated in zoology from Petrograd State University in 1917 with a first-class degree. There, Hoar had studied invertebrate zoology, as well as protistology, under the supervision of Prof. V. A. Dogiel. He was then appointed as an assistant at the Military-Medical Academy. A promising start for a scientific career, but, regrettably, it was interrupted. The Red terror of late 1918–1919 also affected foreigners living in Petrograd. For Hoar, fortunately, it resulted in only two months in prison in 1919. A year later, in June 1920, he and his wife left Russia. The departure was formally authorized by the Academy of Sciences of Russia as a mission to study blood parasites and pathogenic protozoa in the scientific centers of France and England. Hoar was to return to Russia in April 1921. Given that Cecil Arthur's father was English and the scientist had dual citizenship, going to England felt rather like repatriation.

At first, Hoar did not seem to plan to stay in the UK forever, truly expecting to return to Russia shortly, there being some objective reasons to do so:

> "I must inform you that it is very difficult to settle in England and its colonies: there is large unemployment in all areas and supply is higher than demand. Although I am English,

I have no permanent position, but work on a scholarship, the continuation of which is never guaranteed…"[21]

A year later, Hoar was still hoping to find application for his knowledge in Petrograd:

"Very happy to receive your letter. It is pleasant to hear that despite all the adversity, you manage to put scientific work on its feet again. <...> I want to tell you that I greatly appreciate your desire to accommodate me in future. I myself do not lose hope of returning, because the field of activity in Russiais much wider. I think that my stay here can also be useful, because I accumulate "baggage". Thus, I will have a specialty in the field where in Russia, as you know; there are very few experts, in Petrogradespecially".[22]

Hoar worked for about 40 years in the protozoological department of the Wellcome Bureau, London, UK. His curators in the initial stages of his career in the UK were scientists who were known in the field, such as professors C. Dobell and Ch. Wenyon. Hoar studied some representatives from different groups of protists, which include the parasitic species—Amoebozoa, Ciliophora, Apicomplexa—but most of all parasitic flagellates—Trypanosomatina (Kinetoplastidae). The fundamental monograph by Prof. C. A. Hoar, *The Trypanosomes of Mammals—A Zoological Monograph* (1972), is dedicated to one of the most dangerous parasites for humans, namely, parasitic protozoa—trypanosomes. In total, Hoar published more than 180 works; in 1950, he was elected as a Fellow of the Royal Society (Goodwin and Bruce-Chwatt 1985).

It is symbolic that academician C. A. Hoar, soon after his visits to the USSR (1959, 1960) took part, together with Professors Yu. I. Polyansky and E. M. Chesin, in editing and publishing the English translation of "*General Protistology*" — the wonderful book by their teacher Prof. V. A. Dogel - published in Oxford in 1965. His contribution to this publication was specifically noted in a foreword written by his Russian colleagues: "*We are very much obliged to Dr. C. A. Hoare* [sic]*, F.R.S., who so kindly edited the English text of the book and without whose help the book could not have been published in England*" (Dogiel 1965, p. VII).

Dmitry Nikolaevitch Borodin (1887–1957), entomologist, a graduate of the ISPbU, where he studied zoology under the supervision of Prof. W. T. Schewiakoff (Fig. 9). After graduating, Borodin was given the position of Junior Specialist of the Department of Agriculture and worked at the Poltava Agricultural Experimental Station in the Department of Agricultural Entomology (Fokin 2015a, 2018; Borodin 2016). In early 1914, he organized the Entomological Bureau of the Poltava Provincial Land, which was based in his department and which he led as a provincial entomologist. Judging by the sole report that was issued (1914) and the review of the pests within Poltava Province (1915), as well as *the Leaflets of the Entomological Bureau* (1914–1915), the work was quite solid, but the beginning of WWI interrupted it.

[21]Letter dated September 27, 1921. Archive of the author.

[22]Letter dated July 15, 1922. Archive of the author.

Fig. 9 D. N. Borodin. New-York, 1934. Grave Memorial photo

Borodin was drafted into the army in the fall of 1914. As part of the Ural Kazak's Division, with the rank of commissioned officer (horunzhy), he took part in the fighting and was awarded several orders, along with the St. George Cross and its medal "For Courage". After being injured in August 1915, he was transferred to a group of a hundred reservists and, after spending about a month and a half in Poltava, returned to Uralsk.

With the outbreak of the Civil War, Borodin became an officer of the 15th Mounted Regiment of the Ural Army (December 1918), and then a fellow and commander of the 1st Mounted Northern Guerrilla Regiment (July 1919).

During the Civil War, Borodin and his guerrilla unit carried out 5 raids on the rear of the Reds on the Ural, after which he was awarded two more St. George Crosses. After wandering from Rostov to Omsk, during which he experienced a heavy case typhoid, as well as developing permanent malaria, and other events, Borodin spent his last few months in Russia on the Black Sea coast. From there, via Novorossiysk, he left his homeland forever, first stopping in France and then, by November 1920, moving on to America, where his father, the famous ichthyologist N. A. Borodin, was already living.

In the fall of 1921, D. N. Borodin contacted N. I. Vavilov, who was in the United States on a scientific mission, and, having met him in California, offered to organize a program to introduce cultural and wild plants from America to Russia.

As a result of this proposal, the New York Branch (Russian Agricultural Bureau) of the Department of Applied Botany and Selection of the State Institute of Experimental Agronomy was opened in the USA, headed by Borodin.[23]

Despite financial support from Soviet Russia and the allegedly favorable attitude of Moscow, Borodin understood very well that it was impossible for him to return to his homeland: "*Do not invite me to Russia soon, I will not come. But I will do whatever I can—I can find my way around here, so much so that soon I will become indispensable*" (Vavilov 1994, p. 222). The mission of the new bureau was to supply Russia with breeding and seed material, establish ties with foreign scientists and supply foreign literature. In the first two years alone, the bureau organized the transfer of 8000 samples of breeding seeds and more than 5500 brochures and books to Petrograd. Borodin's mission to supply Russia with literature and agricultural seed fund was carried out by the bureau in 1922–1923 through the ARA (American Relief Administration), the organization headed by his acquaintance H. Hoover, the future President of the United States. Borodin facilitated the meeting of the representatives of the C. N. Roerich Institutions with the deputy of Russia, L. B. Krasin,[24] in 1925 in Paris.

Data on the professional activity of D. N. Borodin after 1926 are quite scarce.[25] It is known that he was an employee of Columbia University, wrote several articles on agricultural engineering, was, at one time, interested in "vernalization on Lysenko", worked at the Marine Biological Station in Woods Hole, MA, on experimental biology and was even a guest in the laboratory of Prof. T. H. Morgan in Pasadena, CA, where he hoped to start "something genetic". Borodin was, for a time, passionate about collecting materials dedicated to Russian biologists and even wrote several articles about them.

He died in New York City on June 16, 1957. The inscription on his grave stone reads: *Intelligent Enthusiast*. Apparently, that is how he defined his life credo himself. D. N. Borodin is the only one among my heroes who actively took part in combat against the Bolsheviks, and then helped to feed Soviet Russia.

Boris Phedorovitch Sokolov (1889–1979), protozoologist, medical doctor, biochemist, politician, journalist, and writer (Fig. 10). Sokolov was a graduate of the Department of invertebrate zoology at ISPbU (1912) and the Medical faculty of the Psychoneurological Institute (1916), as well as a military doctor on the medical train on the South-Western front of WW I (1917). Sokolov was a member of the all-Russian constituent Assembly (1918) and of the provisional government of the Northern region, Arkhangelsk (1920). Scientifically, he worked as an assistant in the Zoological Department of the Petrograd Scientific Institute (1918–1920). His life story, especially in its first third, which was spent in Russia, resembles the plot of a novel, in regard to the diversity and intricacy of its events. It was described by

[23]That is why D. N. Borodin is quite often mentioned in the literature as a pure botanist.

[24]N. C. Rorich (1874–1947), well-known Russian artist, screenwriter, philosopher-mystic, writer, traveler, archaeologist, and public figure; L. B. Krasin (1870–1926), Russian revolutionary, member of the Central Committee of the Communist Party, member of the Defense Council, Soviet statesman and party figure.

[25]Borodin is known to have published about 10 articles in the USA.

Fig. 10 B. Ph. Sokolov. Lakeland, 1948?

Sokolov himself, in the form of stories that were included in two of his autobiographical books (Sokolov 1956, 1973).

In 1920, he emigrated from Russia. He lived a long life, two thirds of which he passed outside of Russia. The life history of B. Ph. Sokolov differs, to a certain extent, from the fate of many of his fellow biologists, both from the older and younger generations (Fokin 2015b). On the one hand, when the Bolshevik coup of 1917 occurred, he was still an inexperienced scientist, who had just managed to pass his Ph.D. exams. Having left Russiain 1920, he certainly could not expect to find a place in the West and continue his scientific career. On the other hand, unlike most of his colleagues, he was seriously involved in the political processes that took place in Russia during the years of the revolution. By the end of 1917, he had become a rather well-known member of the SR party.

After emigration to Estonia, Dr. Sokolov soon received an English visa, and briefly stayed in London, where he apparently failed to find a job. For some time, also to no avail, he tried to settle in Prague[26] and Paris and, from the spring of 1922, temporarily settled in Belgium. The scientist wrote:

[26]It was in Prague that he was finally able to obtain his Ph.D. in zoology, in 1924.

> "With my arrival in Brussels, my adventurous life ended, but strangely: for the first six months in calm Brussels, I couldn't sleep. Running through Soviet Russia, crossing borders, in the coal pit of the ice breaker, in the Butyrskaya prison I always slept as a child, staying in excellent health. But in Brussels, the consequences of the accumulated tension made themselves felt" (Sokolov 1973, p. 202).

At the beginning of 1928, Sokolov secured the opportunity to go to the United Statesas a volunteer at the Rockefeller Institute in New York City. This trip determined his whole future life, as he never returned to Europe.

In the West, he mainly studied the mechanisms of cancer, as well as the biological properties of antibiotics and vitamins. Dr. Sokolov was also a journalist and writer. He was the author of more than 30 books*: Rebellion and the Search For* (Prague, 1921), *Save the Children* (about the children of Soviet Russia) (Prague, 1921), *Thomas Masaryk*. *Biography* (Paris, 1921), *About Those Who Seek* (Prague, 1926), and *At the Turn: Stories from Soviet Life* (Paris, 1928)[27] are just some of them. Dr. Sokolov went on to publish about 30 popular science books in the United States.

In America, his scientific career was quite successful: until 1930, he worked at the Rockefeller Institute of Medical Research, in the laboratory headed by Prof. J. Murphy, who was renowned for his experimental research in cancer; moreover, in the summer of 1928, he spent about a month at the famous Marine Biological Station in Woods Hole (Massachusetts). Following that, Sokolov worked on the same subject matter at Columbia University's Crocker Institute (1930–1931), and for four years, he was a member of the Department of Pathology at Washington University in St. Louis. He was granted American citizenship in 1933; then (until 1943), he worked again as a researcher at Columbia University. In 1947, he received an offer to move south to Florida, where he headed the Cancer Research Laboratory at Lakeland Southern College. It was his final place of work: he was in charge of the laboratory until the last years of his life.

Near the end, he focused on finding non-toxic anti-cancer antibiotics. After studying more than 600 different fungi collected in Florida, two antibiotics of new composition, absolutely non-toxic and with high anti-cancer activity, were identified. He worked on this project until his death. Sokolov died at his home, in Lakeland, on November 18, 1979, five days after his 90th birthday (Groth 1979, pp. i–iv).

3 "Control" Case

Alexander Alexandrovitch Filipchenko (1884–1938), doctor of medicine (Rome, 1915) and scientist-parasitologist (Petrograd—Leningrad, 1923–1937), the younger brother of Y. A. Filipchenko (founder of the Petrograd scientific school of genetics),

[27] All of these books were published in Russian – I translated the titles into English myself.

Fig. 11 A. A. Filipchenko. Leningrad, 1937

and one of the founders of ecological parasitology in Russia (Fokin 2015c). Filipchenko returned to Russia just before October 1917 (Fig. 11).

In 1903, after his graduation from the Second St. Petersburg's gymnasium, A. A. Filipchenko entered the Military Medical Academy in St. Petersburg. However, in his first year there, he became actively involved in revolutionary work and joined the party of social revolutionaries (SR). After his second arrest, in September 1906, Filipchenko was sentenced by the St. Petersburg Military District Court to six years of hard labor. He served his time in Gorny Zerentuya (Zerentuy Hard Labor Prison, Nerchen District, Siberia) beginning in October 1907, and thus had failed to complete his studies. In the summer of 1909, he developed tuberculosis, and was permitted to move to a settlement in Barguzin (close to Baikal Lake). From there, Filipchenko fled to Europe in the autumn of 1909, where, at first, he lived in Germany (Munich). Later, he decided to continue his medical education, so he moved to Italy and, at the end of 1910, entered the Faculty of Medicine of Rome University, from which he graduated in 1915. For several months, he worked as an assistant at one of Rome's major municipal hospitals, and then, until February 1917, as an "Earth doctor" in Montecosaro, near the Adriatic coast.

After the February 1917 revolution in Russia, the Russian consulate in Genoa officially announced that emigrants could return to their homeland, and would be given passports and travel money. On June 15, 1917, A. A. Filipchenko and his family ended up in Russia, in revolutionary Petrograd. After swiftly moving to Kiev, Dr. Filipchenko worked as an assistant in a surgical hospital; he also worked in an outpatient clinic and in the Department of Medical Diagnostics at the local university. In January 1918, he was appointed Head of the Department of

Management of the Ukrainian Red Cross, and in early 1919, he moved to in Odessa. From summer 1920 to autumn 1923, he lived with his family in a village, engaging in peasant labor, and only in 1923 did Dr. Filipchenko return to Petrograd, where he soon shifted his activity from medicine to parasitology.

The great scientist's widow recalled this time as follows:

> "During the years from 1924 to 1937 Alexander Alexandrovitch completely reclassified from medical doctor to parasitologist. He worked at least 16 h a day for these 14 years. Often even more. Getting up at 6 o 'clock, in the morning, he used to work at home before going to the institute. In the evening he worked again at home, where he had his own microscope and a whole laborator".[28]

In the questionnaire he filled out upon entering Leningrad State University (LSU) in 1930, Filipchenko did not hide his SR past, naming the members of the party from 1903 to 1912. It is obvious that, after 1912, he had really lost interest in political activity; moreover, he spoke very negatively about his former party in correspondence with his brother.

Reflecting on the beginning of the "Red terror" in June 1919, he wrote to his brother:

> "It is necessary to solve the question once and for all—it is possible to kill or not? And I think you can. If you can kill looters in war, if you can kill an enemy in war, I don't understand why you can't kill in order to carry out great ideas. I could not do that, under any conditions or in the name of any ideas and ideals. But I understand that the power of the Bolsheviks, because they want to be in power at the moment, should practice shooting. It is awful, but it is a necessity".[29]

Apparently, at that time, a lot of Soviet "sympathizers" thought so as well. It did not occur to them that, one day, it would be their turn.

Judging by the time that he devoted to science, one could have expected Filipchenko not only to have written textbooks on parasitology, but also to have been an active, creative participant in the development of the new scientific direction created at LSU. However, the spring semester of 1937 was the last in his life as a scientist. On August 1, Dr. Filipchenko was arrested by the NKVD[30] body in the Leningrad region on charges of anti-Soviet agitation and propaganda. In March 1938, on the same grounds, a new criminal case was brought against him under the terrorist act and organized anti-Soviet activity articles. On September 20, 1938, the Military College of the Supreme Court of the USSR sentenced an absolutely innocent man to death by execution, as well as ordering the confiscation of his property. The next day, September 21, Filipchenko was shot in Leningrad.[31]

A doctor of medicine by education and first specialty, and then a parasitologist, one of the founders of the Russian Parasitological Society (1928), a man whom academician V. I. Vernadsky called a major scientist and a noble man, A. A. Filipchenko did quite a lot for Russian parasitology during his 7 years of

[28] Recollections of A. V. Filipchenko. Copy in the author's archive.
[29] MD RNL. Fd. 813. F. 603 P. 89.
[30] People's Commissariat of Internal Affairs.
[31] He was rehabilitated on November 21, 1956.

work at LSU (1930–1937) and during' his 14 years of parasitological studies in Petrograd/Leningrad (1923–1937). His name rightly stands among the founders of ecological parasitology in Russia (Fokin 2015c).

4 Conclusions

The heroes of this article found themselves in exile at different times, arriving there in different ways and, obviously, for different reasons—from expulsion by the Soviet authorities (Novikov) to an attempt to start a new personal life (Davydov). Among them were "defectors" (Hoar) and people (Uvarov and Shitz) who just happened to be abroad during the change in political regime; those with a desire to return to Russia (Shitz) and those with a clear understanding that it could not be done (Uvarov). Only Chakhotin demonstrated a drastic change of view in regard to what had happened in 1917. Although it helped him 38 years later to return home, repatriation brought no consolation to him. The path taken by A. A. Filipchenko could be treated as a control case: he arrived in Russiajust before the revolution of 1917, and this decision led to his death. Thus, a person who was not only innocent, but also believed in the new Russian power, was simply killed, along with millions of other citizens.

In the West, most of my heroes retained their profession, but only some (Metalnikov, Davydov, Uvarov, Hoar and, to some extent, Novikov) really made significant contributions to various fields of biology during their emigration time. It is fairly obvious that, at home, they would not have had such an opportunity. Most of them would likely have been killed in the 1930s by the criminal Soviet state. Some emigrant zoologists had to completely change professions and often found themselves on the brink of poverty (Shitz). In general, the resistance of the people of that generation is admirable!

The fates of zoologists who left Russia turned out to be disjointed, facilitated by differences in age (activity), fame, scientific potential, ties and simple luck—a combination of circumstances that gave some a chance to take their appropriate place in the Western scientific world, and some not. However, it should be noted that most Russian emigrant zoologists managed to remain in their profession. Moreover, some of them even contributed substantially to science, while already working in the West.

It is obvious that, in many ways, the emigrant's fate was determined by their starting position at the time that they left. Dr.Sc and Ph.D. zoologists of middle and older age, professors, heads of university departments, who repeatedly visited and worked in the West and had scientific ties there, a priori had a greater chance to continue a scientific career under new conditions, although, for this category of emigrants, living conditions and opportunities in the field of science were rarely favourable from the start.

At the same time, young scientists, newly graduated university students, Ph.D. students and people who had only just finished their Ph.D. theses usually had neither a strong scientific name nor connections among foreign colleagues. Often, they left their homeland under the pressure of circumstances, absolutely unaware of where they would find opportunities for application of their professional skills, if they found them at all. The personal abilities and levels of proactivity of those who left, of course, played an essential role, although they did not always guarantee successful adaptation to the new environment.

It seems to me that the study of the biographies of the heroes of this article makes it possible to highlight the different outcomes of the fates of our compatriots abroad. Possibly, such distinctions as follow may apply to immigrant scientists of any specialty:

1. Successful integration, as a result of having already made names for themselves during their Russian periods.
2. Creation of a significant name within the scientific community from nothing only after emigration.
3. Existence within the western scientific community, but without any possibility of a significant career.
4. Change of profession due to the inability to apply their zoological knowledge under the circumstances of emigration.

The variety of the scientific fates of my heroes in the West fits well with the proposed scheme. Curiously, it seems that many emigrants deliberately reduced their age to start a scientific career in the West: B. P. Uvarov by three years, D. N. Borodin by two years, and B. Ph. Sokolov by four years.

It has become commonplace to talk about how much Russia has lost, including losing millions of citizens after 1917. I am not talking about the millions of dead, but, fortunately, about the survivors—those who, after a drastic turn in Russian history, managed to leave or flee the country, those whom this country itself expelled. Most of them were honest people and good workers. Thousands of them were talented, dozens were brilliant. However much we may repeat it, truth does not cease to be truth. It is also fair to apply this notion to Russian scientific emigration. Having been deprived of the opportunity to continue their research in their homeland, not all of the scientists who left were able to fully realize themselves in the West—in Europe or America, although it is clear that, in their homeland in Soviet times, they would simply not have had any future. Russia lost them—the world acquired them. However, science and its advancement have no national boundaries—everything written and discovered by scientists belongs to humanity and eventually becomes part of our common cultural history.

After October 1917, about 2 million people left the country in different ways; many of them were educated people. Not all of them managed to establish their lives outside the homeland. However, those who remained in Soviet Russia, willingly or by force of circumstances, paid for it with decades of moral oppression and humiliation, and often with their own lives. The Soviet government somehow managed to destroy about 1/5 of its own population.

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Aldo Mieli (1879–1950) and the Origin of the History of Science in Spain: From the Creation to the Dissolution of the Spanish Group

Antoni Roca-Rosell

Abstract

Soon after its creation, the International Academy of the History of Science promoted national groups by bringing together its members in each country with other scholars. The Spanish Group was set up in 1931 and included some outstanding Arabists, such as Julià Ribera Tarragó (1858–1934), a founding member of the Academy, and independent scholars such as Antoni Quintana Marí (1907–1998) and Francisco Vera Fernández de Córdoba (1888–1967). As is known, the 3rd Congress was scheduled to be held in Berlin in 1934. After Hitler and the Nazis came to power in January of 1933, Aldo Mieli, the permanent secretary of the Academy, decided to move the event to another country. He had already met his Spanish colleagues on several occasions and had asked them to organise the Congress. At that time, Spain had become a Republic in which democrats from around the world placed their trust as a possible alternative to fascism. Nevertheless, the organisation of the congress exposed some marked differences among the Spanish scholars, some of whom would not accept the direction that the Academy wished to take. This led to the dissolution of the Spanish Group and the organisation of the 3rd Congress in Portugal in 1934. We analyse the circumstances of this controversy among the different actors involved. The analysis of this debate is based on the different conceptions of the Historiography of Science, as well as some political issues concerning the structure of the new Spanish Republic, an episode that is not only relevant to the Historiography of Science in Spain, but also sheds some light on the early development of the discipline worldwide.

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Aldo Mieli · Antoni Quintana Marí · Origins of the International Academy of the History of Science · 1934 International Congress · Amateurism versus profession · Crisis of the Spanish Group · Catalan Section

1 Introduction

Aldo Mieli was one of the pioneers of the History of Science in the early 20th century.[1] He belongs to a generation in Italy that devoted a considerable amount of effort to recovering the Classics, but, in accordance with the conceptions of Ernst Mach and Wilhelm Ostwald, he believed that the History of Science was a new discipline that helped in understanding the development of science. He published articles in several journals and, in 1919, founded his own journal, *Archivio di storia della scienza*, *Archeion*.[2] Owing to the rise of fascism, he was forced to leave Italy in 1927, and resumed his activity in exile in Paris. It should be remembered that Aldo Mieli was one of the promoters of the International Academy of the History of Science in 1928.[3] In 1939, he was obliged to leave France in order to escape the Nazi occupation, and this time he moved to Argentina, where he founded a centre for the History of Science. However, he again became a victim of repression after the military coup of 1943. He died after an illness in 1950, and his work subsequently dropped out of sight from the international academic scene, except in the Spanish-speaking world, where his *Panorama general,* of which he was able to prepare only the first two volumes,[4] was taken up and completed by his colleagues in Argentina, the mathematician José Babini and the historian Desiderio Papp.[5] Here, then, is a figure whose Hebrew origins, socialist convictions and the fact that he was gay made life very hard for him.

[1]See, for example, Babini 1979. Pogliano 1983. Fox 2006. Redondi 2008. Righini Bonelli 2008. Abbri 2010. Chimisso 2011.

[2]The issues of *Archeion* from 1927 to 1943 are freely available online: https://bibdig.museogalileo.it/Teca/Viewer?an=337261 (consulted in March, 2020).

[3]The original name was the “Comité International d’Histoire des Sciences”, probably because it derived from the Comité International de Sciences Historiques, set up in 1926. The first congress took place in Paris in 1929, when the committee adopted its formal structure. Aldo Mieli was elected permanent secretary. The committee adopted the “academy” moniker at the meeting of May 1932. *Archeion* XIV: 259.

[4]Mieli. ed. 1945–1961. Mieli presented a plan for eight volumes and prepared the first four. After Mieli’s death in 1950, José Babini and Desiderio Papp completed the collection, adding three new volumes. There were almost two editions. On the influence of these volumes in Spain, see, for example, López Piñero 1979. Navarro Brotons 1983.

[5]Babini 1962. Ortiz and Pyenson 1984.

In this paper, we discuss the role played by Aldo Mieli in the early period of the modern Historiography of Science in Spain.[6] At the same time, we trust that the paper will extend recognition to Mieli for his contribution to our discipline.

2 The National Groups of the Academy

In 1930, the International Academy of the History of Science promoted national groups by bringing together members of the Academy and other scholars, with the aim of strengthening the History of Science as a field of study, as well as creating new links among more experienced scholars and enthusiasts eager to learn more about the origins of science and technology. These first national groups were created in 1930–1931, in France, Italy, Czechoslovakia and Spain. France provided the conditions for setting up the Academy in centres such as the Centre International de Synthèse, the university faculties and the academies. Italy was a very dynamic country in the field, and Mieli himself was an example of the vitality of historical studies. The National Group of Czechoslovakia was the first to announce its establishment in December, 1930, the report of which was published in *Archeion* (1931. XIII: 84–85). The group was constituted with the support of several Czech academies: the Czech Academy of Letters and Sciences, the Masaryk Academy of Labour, the Academy for Agriculture, the Technical Museum, the National Museum, the Museum for Agriculture, and the Karlova and Komenský universities. There were two Czech members of the Academy for the History of Science, Emanuel Rádl (elected in December 1928) and Quido Vetter (correspondent from 1930), who was appointed president of the new Czech group.

3 The Spanish National Group (1931)

In the same issue of *Archeion* mentioned above, there is a short article on the constitution of the Spanish group. It states that the official address of the Group was 56, San Vicente street, Madrid, at the house of Miguel Asín Palacios (1871–1944), who was also an effective member of the Academy. The report includes the names of the eight members: together with Asín Palacios, there was Julià Ribera Tarragó (1858–1934),[7] an effective member from 1928; the correspondent members Agustín-Jesús Barreiro (1865–1937),[8] member of the Royal Academy of Exact, Physical and Natural Sciences of Madrid, and José-Augusto Sánchez Pérez (1882–1958),[9] secretary of the group; the remaining members, known as the “rédacteurs”

[6] I completed a study on this period some years ago in my paper Roca-Rosell 1991.
[7] Ribera Tarragó was a member of the Royal Spanish Academy.
[8] Barreiro was a member of the Order of Saint Augustine.
[9] In 1934, Sánchez Pérez joined the Royal Academy of Exact, Physical and Natural Sciences of Madrid.

of *Archeion*, were Cándido Bolivar Pieltain (1897–1976), professor at the University of Madrid; Josep Maria Millàs Vallicrosa (1897–1970), then a professor at the same university; Cándido Ángel González Palencia (1889–1949), also a professor in Madrid; and Armando Cotarelo Valledor (1879–1950), professor at the University of Santiago de Compostela.[10]

Five of these members (Ribera Tarragó, Asín Palacios, Sánchez Pérez, Millàs Vallicrosa, and González Palencia) belonged to the Spanish School of Arabic Studies. Supervised by Ribera Tarragó, this school was a relevant research group devoted to the study of the Al-Andalus heritage, including science and technology. George Sarton contacted the Spanish Arabists in 1928 (or before), after becoming deeply interested in Arabic science. It was probably Sarton himself who proposed Ribera Tarragó as a founding member of the Academy. His Spanish correspondence, edited by T. F. Glick,[11] was mainly with Ribera Tarragó's disciple, Miguel Asín Palacios. From 1931, Spain sponsored the Committee, together with France, Germany, Greece, and Hungary, and we know that Ribera Tarragó himself contributed a sum, probably prior to a grant from the Spanish government. This situation changed a couple of years later, when a new team assumed control of the Spanish Group.

4 Aldo Mieli and Spain

Aldo Mieli was interested in Spain for several reasons. First of all, it is quite likely that, after his exile from Italy, he felt drawn to a country with a similar climate and a notable cultural heritage. Secondly, in 1931, the Second Republic was established in Spain after democratic elections, while in Italy (and in other countries), the political tendency was running in the opposite direction. Thirdly, Mieli's conception of the History of Science was based on the analysis of all aspects of science in every country and in every era, rather than solely an account of the outstanding achievements of great men.[12] He regarded the History of Science and Technology as a collective effort, while, at the same time, recognising the role played by individuals such as Leonardo[13] or Lavoisier.

In the case of Spain, like other historians such as George Sarton, Mieli was deeply interested in the role played by Arabic culture during the Middle Ages. It was clear to him that scientists in Al-Andalus had a very significant role in the European Renaissance, so the study of the Spanish sources was of great relevance, and these ideas were reflected in the reviews published in *Archeion,* in which Mieli published a review of two works by Julià Ribera Tarragó in 1929.[14] In this regard,

[10]For information about many of the Spanish members of the Group, see the *Diccionario Biográfico Español*, accessible online from 2018: http://dbe.rah.es/.
[11]Glick 1985 and 1990.
[12]It should be remembered that Mieli was initially influenced by Ostwald in Leipzig. He later also became a follower of the ideas of George Sarton and Henry Sigerist. See Pogliano 1983.
[13]He thought that the correct name was "Lionardo". See Mieli 1950.
[14]Mieli, Aldo. 1929. *Archeion* XI: 277.

one of the most interesting articles, published in 1931,[15] was a review of several books that were representative of the new developments of the History of Science in Spain. These works consisted of three books by González Palencia, one by García del Real, another by Millàs Vallicrosa, and the Spanish translations of books by Dampier, Rádl, and the Portuguese Alberto Pessoa. He refers to works by members of the Spanish Group of the Academy, with the exceptions of Eduardo García del Real (1870–1947), who would become a member shortly after, and also Pessoa, because he wished to include the progress being made in Portugal in the review.

Mieli begins his review by explaining that he had spent the summer travelling around Spain and Portugal, and goes on to mention the changes taking place in Spain with the advent of the Second Republic in April 1931. "Pays merveilleux", he writes, after visiting areas of tropical vegetation, a forest of palm trees (almost certainly in Elche, close to Alicante), and groves of orange and olive trees. He also visited monuments dating from the Roman and Arabic periods, as well as Christian cathedrals and former synagogues, in places such as Tarragona, Sagunto, Girona, Xàtiva, Ronda, Ávila, Córdoba, Granada, Seville, and Toledo. Mieli expressed his admiration for "un grand peuple vivant, qui s'est libéré de chaines séculaires" who were making a remarkable effort towards a new "greatness". Nevertheless, Mieli states that he does not believe that it is appropriate to speak about the new Republic in a journal on the History of Science; instead of doing so, he laments the fact that very little is known about Spanish literary and scientific production in other European countries. According to Mieli, publishers in Spanish needed to shoulder some of the responsibility for this situation. He explains that, on the publication of a work by García del Real on the History of Spanish Medicine, he asked the publishers to send him a copy for review, a request they ignored. Nevertheless, he obtained a copy, and he wrote a review of it that was published in *Archeion* (1922. III: 339). However, by the time that Mieli was in Madrid in the summer of 1931, García del Real's publishers had managed to change his former attitude.

After this introduction, Mieli reviews the books mentioned above. He comments on the work by García del Real and writes a summary of the History (and historians) of Medicine in Spain, in which he highlights the important contributions made by Spaniards to medicine. He also remarks on some exaggerations in the text, as well as pointing out the many typographical errors. Nevertheless, he concludes by stating the significant contribution of García del Real's work. In his review, Mieli goes on to say that a History of Mathematics in Spain had also been published, written by Francisco Vera, a review of which, by José Augusto Sánchez Pérez, is included in the same issue of *Archeion*.

Mieli further remarks that the School of Arabic Studies is one of the most distinguished groups of Spanish academics. According to him, this group consists of the disciples of Julià Ribera Tarragó, a founding member of the Academy, and writes warmly about having met Ribera Tarragó in Carcagente[16] during his summer

[15]Mieli, Aldo. 1931. *Archeion* XIII: 370–381.

[16]Carcagente or Carcaixent is a town in the south of the province of Valencia. It was the birthplace of Ribera Tarragó, as well as the place that he spent his retirement.

trip. However, he failed to meet Ribera Tarragó's successor, Miguel Asín Palacios, who happened not to be in Madrid when Mieli was there. Nevertheless, he was able to meet the mathematician José Augusto Sánchez Pérez, who was also a disciple of Ribera Tarragó. Mieli then devotes the subsequent paragraphs to a review of three books by Ángel González Palencia, another member of the Arabists group, who was also absent from Madrid.

There is a comment by Mieli that is of great interest for our paper from his analysis of Millàs Vallicrosa's work *Assaig d'història de les idees físiques i matemàtiques a la Catalunya medieval* ("Essay on a history of the physical and mathematical ideas in Medieval Catalonia").[17] Mieli acknowledges the significance of this study, which is currently regarded as a classic work on the History of Science in Spain.[18] His analysis of the *Assaig* is preceded by several interesting comments about Catalonia and its nationalist movement. First of all, and perhaps ironically, Mieli apologizes for commenting on Millàs' book, written in Catalan, in a review that was supposed to be about the *Spanish* History of Science. Secondly, while acknowledging the rights of the Catalan people, he states that he is in favour of maintaining the unity of Spain, given the possibility that Catalonia would obtain a large degree of autonomy within the new Spanish Republic.[19] In addition, Mieli points outs that the *Assaig* is written in Catalan, which might pose a problem for the international projection of such a relevant study. He also mentions a mistaken remark he made about the languages of people from Latvia, Finland, Czechoslovakia, Hungary, Croatia, and Serbia, the use of which could make important contributions very difficult to understand. In the case of the Catalan language, however, he believes that the problem is minor one, given that, for anyone with knowledge of Spanish, French, and Italian, it is easy to read.[20]

In the conclusion of his review, Mieli mentions that, during his summer trip, he spent some days in Portugal, where, in Lisbon, he met Arlindo Camillo Monteiro ("mon vieil ami"),[21] Professor Augusto da Silva Carvalho, who had recently been named professor of the History of Medicine in Lisbon, and Alberto Pessoa, whose book on the hospitals of Coimbra he also reviews. In Porto, he met Luis de Pina, a medical doctor with some interesting studies to his name, and states that both De Pina and Monteiro were in charge of organizing the Portuguese group.

Mieli finishes his review by expressing his best wishes for the development of the History of Science in Spain and Portugal, with the hope that these new contacts would collaborate with the Academy in the future. Mieli's enthusiasm for the changes taking place in Spain is quite clear, as is his in-depth knowledge of many particularities of the country, including the question of Catalonia.

[17]Millàs Vallicrosa 1931.
[18]Glick 1977; Roca Rosell 2003.
[19]A Statute of Autonomy was approved in 1932. It was suppressed in 1939 after the Spanish Civil War. Even so, many difficulties had been involved in its development, including its suppression in 1934–1936. See, for example, Jackson 1965.
[20]The end of the review includes some Spanish translations of books by Dampier-Whetham, and Rádl.
[21]Monteiro published a book in 1922 on Sapphic love in Greece.

5 The 1934 International Congress in Spain?

At the 2nd International Congress of the History of Science, held in London in 1931, the Academy decided that the next meeting would take place in Berlin three years later. Karl Sudhoff (1853–1938), historian of medicine and professor at the University of Leipzig, was named president of the Academy,[22] and the historian of medicine Paul Diepgen (1878–1966), the organiser of the Congress, was appointed vice-president.

Nevertheless, circumstances changed after Hitler took power in January 1933. In the minutes of the meeting of the Academy published in *Archeion* (1933. XV: 249–252), there is a letter from Paul Diepgen, dated June 2, in which he asked for the meeting to be delayed for one or two years. The Academy agreed to hold a congress in Berlin in 1935 or 1936, which would have been the 4th Congress, but, as it turned out, this meeting never took place. In the same meeting, the Academy asked the General Secretary to contact any national groups who might be interested in organizing the 3rd Congress in 1934. Afterwards, the report published in *Archeion* included the fact that, in May 1933, Mieli contacted the Spanish and Portuguese groups and obtained their agreement to hold the 3rd Congress in Spain, with additional sessions in Portugal. According to this report, the Congress would be inaugurated in Barcelona on Wednesday, September 19, 1934, and would move to Madrid on the following Friday, September 21. Several excursions were scheduled for the weekend, including a visit to Toledo, while, on Wednesday, September 26, the final session would be held in Salamanca. Finally, on Thursday, September 27, the participants would move to Portugal, where there would be gatherings and sessions in Coimbra and Lisbon.

In the same issue of *Archeion* (1933. XV: 171), we learn that, in May 1933, the Spanish Group had been reorganised. At the meeting held on May 3, during which the establishment of the new group was addressed, the following people attended: the biologist Celso Arévalo (1885–1944); the botanist Francisco de las Barras de Aragón (1869–1955); Agustín J. Barreiro; the philosopher, geographer, and professor at the University of Madrid Eloy Bullón (1879–1957)[23]; Armando Cotarelo Valledor; Eduardo García del Real; José A. Sánchez Pérez; and the mathematician Francisco Vera (1888–1967).

It seems clear that the group had been exhaustively renewed. The first agreement of this new group was to establish a list of its founding members: (a) Asín Palacios, Barreiro, Ribera Tarragó and Sánchez Pérez, i.e., the members of the Academy and of the former Spanish Group; (b) the persons referred to as the "rédacteurs" of *Archeion* (Bolivar Pieltan, González Palencia, Cotarelo Valledor, and Millàs Vallicrosa); (c) the persons participating in the meeting, as well as the pharmacist and professor at the University of Madrid Rafael Folch (1881–1960), who, although not present at the meeting, had sent his acceptance of membership. In addition, the

[22]The first president was the mathematician Gino Loria (1862–1954), whose successor was the medical doctor Charles Singer (1876–1960).
[23]Bullón, a member of the nobility, was also a member of the Spanish Royal Academy for History.

attendees approved a motion to ask the historians of Spanish science to join the Spanish Group. They also decided on the appointment of delegates from the Spanish provinces, as well as agreeing to inform the Spanish Ministry of Education and the academies about the new organisation of the Group. The new president of the Group was Agustín J. Barreiro, and the secretary general was Francisco Vera. Although some of the members of the Spanish School of Arabic Studies were mentioned at the meeting, it appears that this body had lost its influence in the new Group.

6 Serious Controversies: The Congress was Moved to Portugal

Mieli met the Spanish Group in June 1933, when all the details of the Congress had been approved. He also toured Spain and Portugal that summer, but, as he explained in *Archeion* (1933. XV: 426–427), he suffered a serious accident while he was in Aguilas, on the coast of Murcia, where his hand was pierced by the thorn of a sea urchin and required an operation. His condition was very serious, but the surgeon[24] saved his life, although, as a consequence, Mieli was unable to attend the Congress of Historical Sciences held in Warsaw. It is worth pointing out that Mieli and others had organised sessions on the History of Science, which had constituted the origins of the Academy, whose members took advantage of these congresses to get together. Mieli's absence from the event led to some confusion. The minutes of the meeting in Warsaw appeared in *Archeion* (1933. XV: 428–438). Mieli's report, read out by another person, included information about the cancellation of the Congress in Berlin, and the new plan to hold the Congress in Spain from September 19 to October 2. The report contains no further details, and it is mentioned that Francisco Vera, who was present at this meeting, would answer all questions.

In April of that same year, Mieli contacted Antoni Quintana Marí (1907–1998). In a letter dated April 14, he replied to two letters from Quintana Marí who also sent an offprint of a paper recently published in *Ciència* (Quintana Marí 1932). Quintana Marí was a young scholar with qualifications as a primary school teacher, who, at that time, was studying chemistry at the Faculty of Sciences in Barcelona. Thanks to family contacts, he was able to recover an important part of the heritage of Antoni de Martí i Franquès (1750–1832), which was at risk of being lost. This heritage consisted of books, notebooks, letters and instruments (Quintana Marí 1935a. Camós. ed. 2020). In 1932, Quintana Marí organized, in Tarragona, a commemoration of the centenary of the death of Martí i Franquès, with an exhibition of some of the material he had rescued and also lectures by some of the most outstanding scientists of Spain in the fields of botany and chemistry, to which Martí i Franquès himself made contributions (Centenari 1932).

[24]He gives the name of the surgeon, Alejandro Santamaría de Paz, as well as the owner of the hotel where he spent his recovery, Luis Sanz Manchón.

Mieli told Quintana Marí that he was very pleased with his enthusiastic commitment to historical research. He informed him of the existence of a Spanish Group (he mentioned the founders, and also the recent reorganization) and encouraged him to join it by contacting the secretary, Francisco Vera. In fact, letters exist in the family archive referring to Quintana Marí's contacts with the Spanish Group, while his membership as a delegate in Tarragona appears in *Archeion.* 1933. XV: 253.

Mieli also explained to Quintana Marí that, given the financial circumstances of the journal, he was unable to establish a new exchange free of charge with *Archeion*, and consequently asked him to become a subscriber (which Quintana Marí subsequently did). Moreover, he told Quintana Marí that he would be very interested in receiving papers from him, although they would have to be relatively short, because of the accumulation of material at *Archeion*. Lastly, he explained that it would be impossible to publish his papers in Catalan, since that would seriously limit its circulation, and that it would be better to issue it in Spanish or French. Quintana Marí eventually sent his contributions in Spanish.

In December 14, 1933, a decree from the government of the Spanish Republic declared the Congress to be "official", stating that it would take place solely in Madrid, between October 7 and 14, 1934.[25] The Decree named a committee for its organization, presided over by Eduardo García del Real, with Francisco Vera as secretary, i.e. the president and the secretary of the Spanish Group of the Academy.

The Decree was regarded as an important step forward for the recognition of the Spanish community of historians of science, although it contained details that worried the organizers of the Barcelona Congress and the additional sessions in Portugal. There was a clear statement to the effect that the venue of the Congress was to be Madrid and Madrid alone, a decision that ran counter to the plans of the Academy for the Congress also to be held in Barcelona and Salamanca. A further change referred to the dates: from October 7 to 14 instead of starting on September 19.

Mieli wrote to Antoni Quintana Marí on December 21, 1933,[26] in reply to his letter containing a paper for *Archeion,* and with a short note concerning the agenda of the journal on a course on the History of Science organized in Barcelona. He congratulated Quintana Marí for the news about the growth of the Catalan section of the Spanish group. At the end of this letter, Mieli expressed his pleasure at the publication of the Decree, and urged Quintana Marí to contact the organisers in Madrid in order to confirm the details of the Congress.

There also exists a letter from Francisco Vera dated December 30, 1933,[27] probably in reply to a letter he had received from Quintana Mari. In this letter, which also contained the first Circular of the Congress, Vera stated that the opening session ought to be held in Madrid in order to endow it with the necessary

[25] Ministerio de Instrucción Pública y Bellas Artes, Decree, December 12, 1933, *Gaceta de Madrid* 348 (December 14, 1933): 1810.
[26] Aldo Mieli to Antoni Quintana Marí, Paris, December 21, 1933, Archive of the Quintana family, Barcelona.
[27] Francisco Vera to Antoni Quintana Marí, Madrid, December 30, 1933, Archive of the Quintana family, Barcelona.

"solemnity", which could only be provided by the attendance of members of the government resident in Madrid. According to Vera, this would be compatible with the plans to organise an exhibition and some sessions in Barcelona. He asked Quintana Marí to inform him about these plans in order to include the information in the second circular.[28] In the first circular, it is stated that a "prologue" would take place in Barcelona, during which an exhibition on the History of Science would be inaugurated. The circular also states that four sessions would be held for the papers (on the History of Exact Sciences, the Physical–Chemical Sciences, the Natural Sciences and "the General History of Science"), and proposes, as a general theme, the "Scientific exploration of America and the Far East". All the papers were to be accompanied by an abstract in French; there would be an exhibition (in Madrid) with objects and books related to the History of Science, with a corresponding catalogue; the state organization of Tourism would offer the best conditions to accommodate the participants in Madrid. This circular was published in a French translation in *Archeion*. 1933. XV: 448.[29]

The details in the letter and the circular obviously inspired unrest in Quintana Marí and his colleagues, particularly Josep M. Millàs Vallicrosa, then professor at the University of Barcelona and a corresponding member of the Academy.

On January 22, Hélène Metzger wrote to Antoni Quintana Marí about the matter.[30] After telling him that she was completing a work on Lavoisier and offering to collaborate with him, she reached the main reason for the letter, which was to inform Quintana Marí that Mieli was ill. He was suffering from the injury to his hand (after the accident with the sea urchin) and was also waiting for cataract surgery. So, she had been tasked with conveying Mieli's reply to Quintana Marí's letter of January 16. She said that she was writing as member of the Council of the Academy and, as such, agreed completely with Mieli's position. First, she said that Mieli was fully in sympathy with Quintana Mari's protests and those of his Catalan colleagues,[31] and that he failed to understand why the Madrid group was acting in this way. He had also received similar protests from his Portuguese colleagues. Moreover, Mieli had insisted that the reference in the Circular to the decisions of the Congress in Warsaw, at which Vera served as a representative of the Spanish government, but not of the Academy, was not true. He did not accept "the change of dates and the venues of the meetings", and was preparing an official statement

[28]Vera states in this letter that he will write to Quintana again later about other matters. However, while the first letter has a very friendly tone, the second letter, dated January 4, 1934, is completely different. Vera was writing in his capacity as manager of the Journal of the Society of Physics and Chemistry, and, as such, urged Quintana Marí to pay the fees still outstanding from the previous year, suggesting that Quintana Mari had tried to deceive him.

[29]This issue of volume XV corresponds to 1933, but it was actually published early in 1934.

[30]Hélène Metzger to Antoni Quintana Marí, Paris, January 2, 1934. Archive of the Quintana family, Barcelona.

[31]One of whom was Josep M. Millàs Vallicrosa. Nevertheless, we have not been able to find letters from him referring to the quarrel of 1934. The descendants of Millàs Vallicrosa recently donated his manuscripts and books to the Universitat Autònoma de Barcelona, and there is no mention of that question. https://www.uab.cat/web/els-nostres-fons/fons-personals-o-institucionals/detall-1345717051077.html?elementid=1345713788893.

establishing the program of the Congress according to the decision of the Academy. In relation to the sessions in Barcelona, Mieli made an official request to Quintana Marí to organise them. These sessions would take place on October 16 and 17. In conclusion, Hélène Metzger urged Quintana Marí to provide the information he needed. Despite the disagreement, it seems clear that Mieli was adapting the organisation of the Congress to the impositions of the Madrid commission.

The differences between Aldo Mieli and this commission became so serious that the secretary general decided to dissolve the Spanish Group on January 24, 1934, just after Hélène Metzger had written to Quintana Marí. It is possible to attempt a reconstruction of the facts from the news and documents published in *Archeion*, for example, Mieli's report summarizing the events (*Archeion.* 1934. XVI: 114–116). There is a printed circular, dated July 1934, "Motifs qui on obligé…", written in French[32] and signed by E. García del Real and F. Vera, with the support of A. J. Barreiro,[33] that may help to shed light on the stance of the Madrid group.

It turns out that the crisis had exploded early in January 1934. In "Motifs qui on oblige…", it is stated that, sometime before January 7, the Madrid commission had been shocked to learn that a Section for the organisation of the Congress had been set up in Barcelona. The Madrid group believed that the Catalan Section was "independent", which was against the rules of the Academy regarding the creation of National Groups. The replies from Paris and Barcelona failed to convince the Madrid group. In addition, given that the sessions in Portugal were moved before the Congress in Spain, they considered that these sessions could be seen as an "alternative" congress, and asked their Portuguese colleagues to modify (i.e., curtail) their programme.

The Academy decided to organise a meeting in Paris in March 1934. The Madrid commission, formally expelled from the Academy, refused to participate. The situation was addressed at the meeting, held on March 22, 1934.[34] Mieli and the council of the Academy thought that it would be possible to organise the Congress in Spain if the Catalan commission was able to do so. Nevertheless, the Catalan representative, Ramon d'Alós-Moner (1885–1939), secretary general of the Institut d'Estudis Catalans,[35] said that, given the opposition of the Madrid group, it was not possible to hold the congress. As a consequence, and with the agreement of the Portuguese delegation, the 3rd Congress was moved to Portugal.

The Catalan Section, not the Group, had been formally constituted on February 6, 1934. The president of the Section was the archaeologist Pere Bosch Gimpera (1891–1974), rector of the University of Barcelona. The vice-president was Josep M. Millàs

[32]« Motifs qui ont obligé au Gouvernement de la République Espagnole à révoquer la convocation du TROISIÈME CONGRÈS INTERNATIONALE D'HISTOIRE DES SCIENCES devant se célébrer à Madrid du 7 au 14 octobre 1934», July 21, 1934, 4 pp. We have two copies, one from the archive of Quintana Marí's family, and another from the George Sarton papers, Harvard University (thanks to T. F. Glick).

[33]I tried to describe the details of this crisis in Roca-Rosell 1991.

[34]See the minutes of the meeting: *Archeion* XVI (1934): 109–114.

[35]Mieli asked Antoni Quintana Marí to participate in the Meeting, but he was not able to attend, and neither was Millàs Vallicrosa, although their opinions were well represented by D'Alós.

Vallicrosa, and the secretary was Antoni Quintana Marí. When the section was created, the plans to organise the Congress in Barcelona were still ongoing, and the meeting was devoted to organizing efforts for its success.[36] The news was published in *Archeion*. 1934. XVI: 118, in which it was stated that a new Spanish Group was established, first with the Barcelona Section, in agreement with Millàs Vallicrosa, and secondly, with the collaboration of the mathematician Julio Rey Pastor (1888–1962), who had taken the initiative to set-up a new Spanish Group. Rey Pastor had been a professor at the University of Buenos Aires since 1921, but he was still able to exert a great influence in the Spanish academic world. In 1933, he promoted the creation of the Argentine Group of the Academy (*Archeion*. 1933. XV: 442), and, from 1934, he took advantage of his visits to Spain to try to create a new Spanish Group, which was finally announced in *Archeion* in 1936.[37]

The main reason for this two-year delay was due to resistance from the members of the former Spanish Group. In preparation for the 1934 Congress, they had organised a series of lectures starting in November 1933, when the president of the Spanish Republican Government, Niceto Alcalá Zamora (1877–1949), attended the inauguration. This series came to an end in April 1934, by which time the Group had already been dissolved. The minutes of the lectures were published in a book that appeared in 1935.[38] Given that the Spanish Group no longer existed, its remaining members set up the Asociación de Historiadores de la Ciencia Española (Association of Historians of Spanish Science), which figured as the publisher of the book.

All these events were dramatically interrupted in July 1936, by the outbreak of the Spanish Civil War. Most of the characters in our story went into exile (for example, Francisco Vera) or formed a kind of "inner" exile under the Franco Dictatorship. Some decades later, the book published under the auspices of the Asociación came to be regarded as further proof of the Francoist repression. The crisis of 1934 was either ignored or hidden.[39]

The 1934 Congress took place in Portugal, with the participation of Millàs Vallicrosa and his wife.[40] It was there that Millàs Vallicrosa presented a research paper on a medieval almanac, probably published in 1307 in Tortosa, the Portuguese version of which was erroneously included in the 1863 edition of the Alfonsine Tables by the professor of Physics Manuel Rico Sinobas (1819–1898), clearly an amateur historian.[41] Millàs Vallicrosa's paper may be regarded as an example of rigorous historical study in comparison with the amateurism of the nationalistic version.

[36]We analyse these plans in Roca-Rosell 2020.
[37]See: *Archeion* XVIII (1936): 68–70. During these two years, Rey Pastor was in contact with both Mieli and Quintana Marí, the latter of whom became the secretary of the new Spanish Group. See: García Camarero 1990; Roca-Rosell 2020.
[38]Asociación. 1935.
[39]Cobos Bueno 2002 and 2003 knew about the crisis, but ignored the context, stating that it was all a manoeuvre against Francisco Vera. Millàs Vallicrosa avoided any mention of the crisis. Antoni Quintana Marí, when I met him in 1985, had forgotten all about the question, except for his contact with Mieli and the creation of the Catalan Section.
[40]See *III Congrès*. 1936. There is further information on this in *Archeion* XVI (1934): 337–372.
[41]On this subject, see Roca-Rosell 2017.

7 The Crisis of the Spanish Group in Light of the Creation of the History of Science as a Modern Discipline

Several factors can be considered in the controversy surrounding the organisation of the Congress of 1934 in Spain:

First, a centralist view of Spain persisted, even after the establishment of the Republic in 1931, when some autonomy was accorded to Catalonia, although it was regarded as a minor entity. Francisco Vera was a Republican who had close links with the government (as a further example of ties between the two, Cándido Bolivar Pieltan was a member of both the government and the Spanish Group), but he and his colleagues in Madrid did not fully agree with a "composite" vision of Spain. Secondly, two different research approaches existed: there was an interest within the new Spanish Group in collecting "all" Spanish contributions, absent any significant critical viewpoint, while in the Catalan Section and in the group of Arabist scholars, most of the researchers were involved in studies based on historical documents and in trying to evaluate their contributions within an international context. Finally, there is the question of enthusiasts *vs* professionals. The History of Science in Spain, in fact, enjoyed no professional status, although it is true that there were some chairs on the History of Medicine or Pharmaceuticals, but these professors lacked an actual historian's viewpoint of the discipline.

Aldo Mieli was aware of this situation, which, in some respects, was very common in the world at that time. Nevertheless, he appreciated the considerable enthusiasm and activity of the members of the Spanish Group, both in Madrid and in other cities. Moreover, I believe that he was of the opinion that he would be able to help in making progress in the field, as exemplified by the reviews published in *Archeion*.

As we have seen, Aldo Mieli was well acquainted with the Spanish community of Historians of Science. He had a personal commitment to Julià Ribera Tarragó, founding member of the International Academy of the History of Science, who was able to fund the institution with his own resources. Ribera Tarragó, who was in retirement at the time, had promoted a school of Arabic studies, including research into Arabic science and technology. Mieli appreciated Ribera Tarragó's disciples, primarily Miguel Asín Palacios, as well as members of the following generation, such as Josep M. Millàs Vallicrosa. As a historian of chemistry, Mieli also valued the research conducted by Antoni Quintana Marí, a historian who, despite being an autodidactic, understood very well the need for rigour in historiography. Quintana Marí, initially trained as a primary school teacher, was interested in the role that the History of Science would play in the teaching of sciences. This was also a field of interest for Mieli, who asked Quintana to publish on this subject in *Archeion*.[42]

[42]Quintana Marí 1935b. There is a posthumous English version: Quintana Marí 2010. In order to introduce Quintana Marí to the current community of historians of science and also science educators, we published: Roca-Rosell; Grapí-Vilumara 2010.

One of the projects promoted by Mieli was the publication in *Archeion* of "Chronological Tables", referring to different countries, and Francisco Vera was in charge of the Tables for Spain. Despite their personal and academic differences, Mieli published his contribution in *Archeion* (Vera 1942), with the addition of some mild criticism. At the same time, he published the "Table" for Catalonia, drawn up by Quintana Marí 1943.

Quintana Marí's plans and those of his colleagues for the creation of the Catalan Section had much in common with Mieli's conceptions for the consolidation of the History of Science as a discipline. In his notebooks, Quintana stated that a chair in the History of Science should be created, as well as advocating for the publication of a collection of classics of science and the organization of a series of lectures.[43]

Aldo Mieli shared his interest in the Spanish historians with George Sarton, who was in close contact with Asín Palacios and Millàs Vallicrosa (Glick 1990). As stated above, Sarton and Mieli were aware of the need to promote internationally the History of Science and its institutionalisation. For them, both the Academy and their journals (*Archeion*, and *Isis*, in the case of Sarton) were instrumental in the analysis and dissemination of both Spanish and international production.

Aldo Mieli's influence on Spain extended further than this period. Even while living in Argentina, he renewed his presence in Spain with the publication of his *Panorama*… and a series that he initiated on the History of Science. These publications continued after his death in 1950, under the supervision of Julio Rey Pastor and José Babini.

8 To Conclude

The History of Science community in Spain was subject to a bitter debate around the organisation of the 1934 Congress. As a result, we believe that the professionalization of research in this field was strengthened, the context of which was the promotion of national groups undertaken by Aldo Mieli in his position as secretary general of the Academy. The decision of the Academy to dissolve the Spanish Group in January 1934 is a reflection of the need to establish clear options in the field. At the same time, Mieli was devoting his efforts to the partial reconstitution of the Spanish Group. It should be mentioned that the crisis also affected the Academy. In his report on the crisis, Mieli explains that the Madrid Commission and Francisco Vera would try to seek support from some members of the Academy (Ribera Tarragó, Suddof) to speak in Vera's favour, with the express aim of creating a dispute within the council of the Academy. The action against the Madrid Commission should be understood in this context, and thus finally clarify the confusion surrounding this situation.

[43] We analyse the details of the plans of the Catalan Section: Roca-Rosell 2020. On Mieli's (and Sarton's) conceptions, see Bucciantini 1987.

Mieli and the Academy decided to establish a new Spanish Group on the basis of their Catalan colleagues, a process that came to an end in 1936 with the outbreak of the Spanish Civil War. Most of the participants in this conflict ended their careers in exile or as victims of repression. This included Aldo Mieli, who was forced to move to Argentina in 1939.

Nevertheless, Mieli's project was eventually carried out. Millàs Vallicrosa, who continued working in Barcelona, "adapting himself" to the conditions of the Franco regime, was able to organize the 9th International Congress of the History of Science in Barcelona and Madrid in 1959.

Note

I wish to dedicate this research to Antoni Quintana Marí (1907–1998) who provided me with access to his papers in 1985. Quintana Marí remembered his meetings and correspondence with Aldo Mieli very well, including his participation in the creation of the Catalan Section, although he had completely forgotten the 1934 controversy. I am also in debt to Eduardo Ortiz, who gave me some interesting comments. This research is included in the projects HAR2016-75871-R, PID2020-113702RB-I00, and PRX18/00138.

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Jewish Mathematicians, Their Escape from Nazi Germany from 1933 on and Their Paths into Exile

Annette B. Vogt

Abstract

With the beginning of the Nazi regime in Germany, the systematic expulsion of Jewish scientists and students from universities and colleges started in spring 1933. The process of expulsion, robbery and, if the exiled could not flee far enough, murder - often called "exodus" in literature - began with so-called laws and various decrees on these "laws". After the Allied victory, only a few scientists who had been expelled from Germany returned to their colleges and universities. While the literature on emigration and exile is now very extensive, there are only a few studies on the "remigrants" or returnees.

Keywords

Scientists · Mathematicians · Jewish mathematicians · Nazi Germany · Emigration · Aid Organizations for emigrants · Exile

1 Introduction

On the basis of the author's research on Jewish mathematicians in the German-speaking academic world and on the history of Jewish women scientists at Berlin University and the Kaiser Wilhelm Society for the Advancement of Science (Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften (KWG), which

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was founded in 1911)[1], three aspects are dealt with in this paper. After outlining the conditions for Jewish mathematicians in Nazi Germany from the spring of 1933 onwards, the author describes their different paths into exile and the role of academic aid organizations abroad. The conditions for the emigrants in the various countries of exile varied greatly, as did the conditions for continuing to be able to work successfully as academics in the countries of exile. Five preconditions (or assumptions) for scientists (mathematicians) in exile that were necessary in order to be able to continue scientific activities are formulated. If these were not fulfilled, the emigrants had to deal with the end of their scientific activities after the bitter loss of their homeland. In addition, some open research questions are formulated, both for research on exile and the possible return of the emigrants, as well as attempts by German scientific institutions to call back from exile the colleagues who were expelled from 1933 onwards.

2 The Situation in Nazi Germany from Spring 1933 on

Immediately after the Nazis' so-called "seizure of power" on January 30, 1933, the persecution of the Nazis' political opponents and the stigmatisation and exclusion of "non-Aryans", as defined by the Nazis, from all areas of public life began. During the first half of 1933, multiple occasions of horrible mistreatment followed one after the other, and the introduction of various unjust laws was accompanied by the actions of fanatical Nazi supporters, especially in SA uniform, as well as malicious press articles in most newspapers that spread fear and terror even among those not directly affected by the persecutions. This was certainly intended by the Nazi leaders, for they feared nothing so much as protest, opposition or even resistance.

Procedures of the NS authorities and their helpers

The first - and most widely visible - signal was the Reichstag fire on February 27/28, 1933, and the resulting restrictions and laws imposed by the state of emergency that provided the basis for persecution, arrests and harassment. Among the first arrested were members of the "League for Human Rights" (Deutsche Liga für Menschenrechte), which, unlike the political parties in the Weimar Republic, also had many scientists and academics as members. On April 1, 1933, the first so-called "boycott" took place, a pogrom organised, in particular, by members of the SA and the Nazi party NSDAP, which was mainly directed against Jewish shops, doctors' and lawyers' practices, but also took place in front of libraries, in Berlin, for example, in front of the State Library on Unter den Linden.[2] This was

[1]See Vogt (2009, 2012), Vogt (2007), especially Chap. 4.2. (Dismissal and Exile), pp. 260–290, and Vogt (2008).

[2]See Anonym. Why I left Germany. By a German Jewish Scientist. London: Dent and Sons, 1934, pp. 127–128.

The Author has determined that it was written by the socialist and statistician Wladimir S.

followed by unjust laws and various decrees on these "laws", which began the process - often called "exodus" in literature - of expulsion, robbery and murder, if the exiled could not flee far enough. And, on April 1, 1933 a "law" was passed that restricted the admission of lawyers and notaries and legally legitimized the expulsion of politically left-wing and Jewish lawyers. This was followed, on April 7, 1933, by the so-called "Law for the Restoration of the Professional Civil Service". This "Gesetz zur Wiederherstellung des Berufsbeamtentums" did not only apply to civil servants, as the title misleadingly suggested. This "law" provided the legal means to dismiss employees - from secretaries to directors - at all schools, colleges, technical colleges and universities, as well as at all other academic institutions, including the institutes of KWG. At the universities, the expulsion was referred to with the euphemism "withdrawal of the right to teach" (Entzug der Lehrbefähigung) for all private lecturers (Privatdozenten) and professors. Finally, on May 10, 1933, auto-da-fés called "book burnings" took place in the university towns of the German Reich, organised and staged by Nazi students. Before this, lists of "unwanted" literature had circulated, these lists being used to collect books that were then thrown into the fires accompanied by the shouting and staged anger of Nazi students. Photographs of the book-burning in the square in front of Berlin University (today August-Bebel-Platz) went around the world, causing horror and disgust in most countries.[3]

Between January and July 1933, at most universities, fierce clashes between Nazi students and left-wing students took place, especially those students who had been organized into socialist and communist student groups and had not yet been ex-matriculated. The Nazi students organized riots in front and inside of the lecture halls and tried to prevent Jewish professors and Privatdozenten from giving their lectures, for example, at the University of Göttingen against Edmund Landau (1877–1938), and at the Berlin University against Issai Schur (1875–1941).[4]

On August 23, 1933, the first expatriations occurred, i.e., the withdrawal of German citizenship, of 33 people who were particularly well known as opponents of the Nazis and, therefore, particularly hated by the Nazis, among them leading members of the socialist and communist parties and other prominent opponents of the NS regime.[5] Eleven from this first group of expatriated Nazi opponents were members of the "League for Human Rights", journalists, writers, and lawyers. In Paris, the journalist and emigré Carl Misch (1896-1965), who, from 1921 to 1933, had worked for the famous newspaper "Vossische Zeitung" in Berlin, published

Woytinsky (Vojtinskij) (1885–1960). He was a Russian-Jewish emigré who lived in Berlin from 1920 to 1933; from 1929 to 1933, he was the head of the statistical department of the trade union organization ADGB. In February 1933, he escaped to France, and in 1935, he finally emigrated to the USA.

See Vojtinskij Papers, in: IISH Amsterdam, box No. 29, Papka No. 1, "Bibliografija trudov V. S. Vojtinskogo" (bibliography of his works, done by himself), 1928–1936.

[3]See Kantorowicz/Drews (1947, 1983), Berger (1983), Schoeps/Treß (2008).

[4]See Schappacher (1987) on Landau; on I. Schur see Ledermann/Neumann (2003), Stammbach (2003) and Vogt (1999).

[5]The first "Ausbürgerungsliste" (list of expatriation) was published on August 25, 1933, in the newspaper "Reichsanzeiger" and in various other newspapers. All in all, there were 358 such lists.

these lists in 1939, shortly before the beginning of WW II while working in exile for the newspaper “Pariser Tageszeitung”.[6]

In parallel to the expulsions of political opponents and Jewish scientists from universities, colleges and scientific institutes began their exclusion from their respective scientific professional organizations. Depending on the number of convinced National Socialists in these societies, the process of exclusion of colleagues proceeded either quickly and brutally or rather slowly and insidiously. In the German Mathematical Society [Deutsche Mathematiker-Vereinigung (DMV)], the first resignations were demanded in the summer of 1933, but it was not until 1938 that the exclusion of Jewish colleagues was finally enforced.[7]

In September 1935, the so-called “Nuremberg Laws” were issued. This intensified the exclusion of Jewish citizens from all areas of society, and, as a consequence of these laws, they became second-class citizens. At the universities and colleges, this resulted in the forced “retirement” of Jewish scientists who had previously taught there. “Aryan” professors who had “non-Aryan” wives were forced into divorce and, if they refused, were also forced into “retirement”. The last remaining Jewish students were also excluded from the universities at this time. Only those Jewish students who got help, support and evaluation from courageous “Aryan” professors were still able to complete their doctoral theses.

Also in September 1935, a journal began to appear in Germany with the programmatic title “Deutsche Mathematik” (German Mathematics), edited by the fanatical follower of the National Socialists Ludwig Bieberbach (1886–1982).[8] Emil Julius Gumbel (1891–1966), a courageous opponent of the Nazis, who had already been expelled from the University of Heidelberg in summer of 1932 because of the pressure of Nazi students, forcing him to flee to Paris, reviewed the first two issues of this journal in 1937 in the exile literary magazine “Das Wort” (The Word) under the title “Aryan Mathematics”.[9] He described the great discrepancy between the articles written by Nazi supporters and the mathematical articles in which Jewish mathematicians, even those who had emigrated, were still partially quoted. With humour and subtle irony, he sought out particularly “successful” gossip about Jewish mathematicians, and concluded: “The National Socialists succeeded in bringing German universities into line. But it cannot be

[6]See Misch (1939); he published the lists, which were announced by the Nazis between August 1933 and 1938 in the publishing house of the newspaper “Pariser Tageszeitung”; his preface was dated April 1939.

All 358 lists of expatriation (“Ausbürgerungslisten”) were first published completely by Michael Hepp (1949–2003) [see Hepp (1985)]. The three volumes are primary sources for investigating the persecution and the exile.

[7]See Vogt (2009), pp. 213ff and Remmert (2004a, 2004b).

On the history of the German Physical Society (Deutsche Physikalische Gesellschaft) during the Nazi time, see Hoffmann/Walker (2007).

[8]On L. Bieberbach, see Vogt (1999), Vogt (2009), pp. 193–196; on the role of Bieberbach in the Berlin Academy of Science during the Nazi period, see Ciesla (2000), p. 486ff; furthermore, see Mehrtens (1987).

[9]See Gumbel, Emil Julius. Arische Mathematik. In: Das Wort, H.1/1937, pp. 109–110; re-published in: Vogt (1991), pp. 218–221.

assumed that the Ku and Bieber streams will enrich the stream of mathematical knowledge in this way."[10] If the Shoah had not exterminated millions, one might have been able to read with amusement what "Aryan" mathematicians wrote at that time.

After the pogrom known as "Kristallnacht", which was organised throughout the "Third Reich" on November 9, 1938, the Nazi authorities tightened their anti-Semitic policies. In spring 1939, the last remaining "non-Aryan" members of the DMV were forced to resign.[11] At the Academies of Sciences, the remaining Jewish members were also "asked" to resign[12] and Jewish employees were dismissed.[13]

With the beginning of World War II in September 1939, fleeing from Nazi Germany became even more difficult, and with the occupation of many European countries by Nazi troops and Nazi Wehrmacht, the emigrants were forced to flee again. If they were unable to do so, they lived under the threat of arrest and deportation to the death camps. In the summer of 1941, the Nazi authorities prohibited any emigration from Nazi Germany.

3 The Displacement of Jewish Scientists and Mathematicians from Universities

On the basis of the so-called "Law for the Restoration of the Professional Civil Service" of April 7, 1933, all employees, assistants, lecturers, Privatdozenten and professors working at universities and other scientific institutions, including the Kaiser Wilhelm Institutes, had to fill out the notorious questionnaires in which, as a result of the introduction of the "Aryan Paragraph" (§ 3), they were asked about the "religious denomination (also former denomination)" of their grandparents and, in relation to § 4, they had to provide information about (a) their affiliation with any "political parties" and (b) their affiliation with three organizations mentioned by name: the Reichsbanner Black-Red-Gold, the Republican Federation of Judges and Civil Servants and the League for Human Rights.[14] As the Nazis' power established

[10]Gumbel (1937), p. 110, quoted in: Vogt (1991), p. 221.

It is a play on words, the student named Kubach and the mathematician Bieberbach, and "der Bach" is a small stream. It is possible that Gumbel knew the student Kubach from his time in Heidelberg. On E. J. Gumbel see Jansen (1991) and Vogt (1991), Brenner (1990, 2001), Hertz (1997), and more recently Maier-Metz (2015), Heither (2016), Fernández/Scherer (2018), Fernández/Scherer/Vogt (2019).

[11]See Vogt (2009), p. 209.

[12]On the forced withdrawal of Issai Schur from the Berlin Academy of Sciences see Vogt (1999); on the Nazification of the Berlin Academy see Peter Th. Walther (2000) and the exhibition in the Berlin-Brandenburg Academy of Sciences (BBAW) in 2014 (= BBAW (2014)).

[13]See the fate of the employee of the Berlin Academy of Sciences, the legal historian Paul Abraham (1886–1943) who was murdered in 1943, Thiel (2010) and the exhibition in the BBAW (2014), pp. 76–84.

[14]See as an example the questionnaire of the mathematician and Privatdozent at the University of Halle/S., Dr. Reinhold Baer (1902–1979), in: Bergmann/Epple (2009), pp. 202–205.

itself even more, the exclusion or displacement criteria were refined and further organizations of the Weimar Republic were added to the list, according to which membership led to expulsion named as “dismissal”. In the case of grandparents, it was sufficient for displacement if one of the grandparents was Jewish or of the Jewish religion. In doing so, the Nazi authorities ignored both the instructions of the Halakha (a Jew is whoever has a Jewish mother) and baptisms. The churches also followed the exclusion policy, announcing that, from that point on, they would be referring to their members as “Catholic non-Aryans” or “Protestant non-Aryans”. Special rules applied to couples living in “mixed marriages” (one “Aryan” and one “non-Aryan” spouse), but the “Aryan” spouses were put under tremendous pressure, and often forced to divorce. From 1935 onwards, if this pressure was not heeded, university professors were displaced from the university and had to go into so-called “retirement”.

After the questionnaires had been issued, filled out and sent to the respective authorities (the Ministries of Culture of the German states) in spring 1933, the dismissals ordered thereupon or, in the case of the Privatdozenten, the withdrawal of the venia legendi, took place from the summer of 1933 onwards. The text was always identical and laconic:

> Due to § 3 of the law of 7 April 1933 on the re-establishment of the professional civil service, I hereby revoke your authorisation to teach at the university….[15]

If Jewish mathematicians were editors of mathematical journals, they were expelled from those positions as well. This affected Otto Blumenthal (1876–1944) at the “Mathematische Annalen” (Annals of Mathematics), Issai Schur (1875–1941) at the “Mathematische Zeitschrift” (Mathematical Journal), and Richard von Mises (1883–1953), as founder and editor of the “Zeitschrift für angewandte Mathematik und Mechanik” (Journal of Applied Mathematics and Mechanics).

The “law” of April 7, 1933, served to expel all political opponents and all Jewish (by the NS definition) employees and workers from all public sector institutions - from schools, colleges and universities and from all scientific institutions. At the industrial research institutes, where a large number of Jewish mathematicians were employed, the expulsions usually took place at a later date, unless the personnel authorities immediately adopted the rigid expulsion policy in anticipatory obedience or because of their Nazi convictions.

Due to the socialization of German and German-Jewish academics, only a few had been members of political parties before 1933, and most Jewish mathematicians were displaced because of § 3 (the so-called “Aryan Paragraph”). During the Weimar Republic, however, scientists, including mathematicians, had often been members of two organizations that were on the exclusion list: the “League for Human Rights” (Liga für Menschenrechte) and the “Society of Friends of New Russia” (Gesellschaft der Freunde des neuen Russland).

[15] See, for example, the letter to Dr. Reinhold Baer, September 7, 1933, in: Bergmann/Epple (2009), p. 199.

The "League for Human Rights", which emerged in 1922 from the "Bund Neues Vaterland" (Union of New Homeland, a pacifist organization established in 1914) and was a member of the "International League for Human Rights" founded in Paris in 1922, advocated early on for an understanding with the former opponents in World War I, especially France. The "League" published brochures on the background of the First World War, German war guilt, and the dangers of the emerging National Socialists and "Fascist Murders", among other topics.[16] The Nazis considered the "League" to be close to the SPD (Socialdemocratic Party of Germany) and perhaps more dangerous than their political opponents, the SPD and KPD (Communist Party of Germany). Members of the "League" included: Kurt R. Grossmann (1897–1972), who had worked for the "League" for many years and was its General Secretary from 1926 to 1933; Carl von Ossietzky (1889–1938), the editor of the weekly magazine "Die Weltbühne" (World Stage), who received the Nobel Peace Prize in 1936; the journalist Berthold Jacob (1898-1944), who perished in Gestapo imprisonment after being handed over to the Nazis; the writer and columnist for the "Weltbühne" Kurt Tucholsky (1890–1935); the women's rights activist Dr. Helene Stöcker (1869-1943), a member of the council of the League from 1922 to 1932; as well as Albert Einstein (1879–1955) and the mathematicians Emil Julius Gumbel (1891–1966),[17] Max Dehn (1878-1952) and Otto Blumenthal (1876–1944).

The "Society of Friends of New Russia", founded on June 1, 1923, in Berlin, claimed to be close to the KPD, and had its own publishing house, where the journal "The New Russia", with the subtitle "Journal of Culture, Economy and Literature", was printed. Founded after the Rapallo Treaty with the aim of reporting objectively on developments in Soviet Russia and promoting and supporting exchange, especially in science and culture, its members included many artists, writers and scientists. At many universities, there existed special groups of the society. Despite official state relations between Germany and Soviet Russia, the "Society of Friends of New Russia" was under permanent observation by the "Reich Commissariat for the Supervision of Public Order" (Reichskommissariat zur Überwachung der öffentlichen Ordnung, a kind of FBI) during the Weimar Republic. In the spring of 1933, the Society was destroyed by the Nazis, its Secretary General, Erich Baron (1881–1933), was arrested by the Gestapo on February 28, 1933, and murdered in prison on April 26, 1933. The Nazis confiscated all records and documents. Members of the "Society of Friends of New Russia" included: Paul Löbe (1875–1967), President of the Parliament (Reichstag) from 1920 to 1932 l Georg Wilhelm Graf von Arco (1869–1940) from the Telefunken enterprise; the architect Mies van der Rohe (1886-1969); the art historian and writer Eduard Fuchs (1870–1940); the members of the "League for Human Rights"

[16]See Gumbel, Emil J. "Lasst Köpfe rollen". Faschistische Morde 1924–1931. Berlin: Verlag Deutsche Liga für Menschenrechte E. V., 1931, published again in: Vogt (1991), pp. 47–80.

[17]On Gumbel, one of the founding members of the League and a member of the "Bund" since 1916, see Jansen (1991), Vogt (1991), Brenner (1990, 2001), Hertz (1997), Maier-Metz (2015), Heither (2016), Fernández/Scherer (2018), Fernández/Scherer/Vogt (2019), and Vogt (1995, 2001).

Dr. Helene Stöcker and Albert Einstein; as well as Gumbel and Blumenthal. Otto Blumenthal had headed a group of the Society at the Technical College (TH) Aachen of which the physicist Gerhard Harig (1902–1966) was a member. From 1927 to 1933, he worked at the TH Aachen, he was expelled by the Nazis. He survived the exile in the Soviet Union, arrest by the NKVD and deportation to Nazi Germany where he became a political prisoner in the concentration camp Buchenwald. From 1946, he taught history of science at the University of Leipzig, where another former member of the Society, the physician Felix Boenheim (1890–1961), was professor from 1949 to 1959.

It is an open research question how many Jewish academics were expelled from universities and colleges after 1933 as political opponents of the Nazis, i.e., those displaced because of political activities, instead of racist Anti-Semitism. It is known that the mathematician Emmy Noether (1882–1935), an openly declared fellow traveller of the SPD in Göttingen, was thrown out of her apartment by the landlady as early as 1933. Her brother, Fritz Noether (1884–1941), was close to the KPD, and his exile country, the Soviet Union, became a tragic trap when he was arrested by the NKVD on false charges in Tomsk, where he taught at the university; he was later shot as a "spy". Hans Reichenbach (1891–1953) and Richard Courant (1888–1972), who succeeded in emigrating to the USA, were fellow travellers of the SPD. Moreover, Richard Courant had close relations with Soviet mathematicians who regularly visited Göttingen between 1922 and 1932.[18]

The most politically active mathematician during the Weimar Republic, as well as during the years of exile, was definitely Emil Julius Gumbel. He was the only scientist among the 33 people on the first "Expatriation List" (Ausbürgerungsliste) of August 23, 1933. The Nazis called the persecuted people "traitors to the people, expelled from the German Volksgemeinschaft", as the "Reichsanzeiger" expressed it on that day.

The expatriation, i.e., the withdrawal of German citizenship, affected the emigrants in two ways. As stateless persons, they had hardly any rights in their respective country of exile and were dependent on the solidarity of political friends or colleagues. Expatriation also implied robbery, because the emigrants were deprived of all their assets in favour of the Nazi state.[19] The self-confident Gumbel called the expatriation the "Pour le Mérite" of the emigrants",[20] and with regard to the names on the first list, he could indeed be proud to be there together with his friends from the "League for Human Rights".[21] During his French exile, he got help

[18]See, for example, Aleksandrov (1977), the memories on Göttingen of Pavel S. (1896–1982) Aleksandrov (also Alexandrov, Alexandrow).

[19]See Hepp (1985).

In exile, the "Expatriation List" was referred to by the opponents of the Nazis as the "enemy" list, as Harold Gumbel (1921–2016) remembered; he also remembered that his father was always proud of being on this first list; see Fernández/Scherer/Vogt (2019), p. 60 and pp. 52–53.

[20]The "Pour le Mérite" is an order of merit established in 1740 by King Frederic II of Prussia; it was awarded as both a military and civil honour. After WW II, the civil class was re-established in 1952, and this version is still active today.

[21]Together with him, Kurt-R. Grossmann was expatriated [see Grossmann (1969)], p. 328; Grossmann published this book about the refugees and his experiences as a refugee and an organizer of aid agencies, first in Prague, later in Paris; he later escaped to the USA.

from mathematicians and members of the "Ligues des Hommes de Droit". A quarter of a century later, E. J. Gumbel confessed, in retrospect, in an interview for the broadcast Radio Bremen (1959):

> The little I may have accomplished in the past exists within me, and I have no reason to hide my past. On the contrary, everything I wrote against the Nazis I still believe to be true today, and if I have a reason to be proud, it is that I recognized earlier than others the dangers that threatened Germany, Europe and the world.[22]

Although E. J. Gumbel, as a politically active mathematician, was not surprised by the Nazi persecution, he, too, had to struggle with the difficulties of exile, like the search for a job as a mathematician and life in other scientific cultures. He experienced the solidarity of his friends in the "International League for Human Rights", and he found support from the aid organizations that had been established.

Aid Organizations for emigrants

Soon after the first sanctions to expel the scientists, academic aid organizations emerged abroad to provide assistance to those displaced from colleges, universities and other scientific institutions. For economic and nationalistic reasons, among others, most of the offers of help consisted of awards of scholarship and temporary positions; permanent positions were much rarer. However, in the spring of 1933 no one could have known at that time what would happen next. The opponents of the Nazis expected and hoped for an early end to the Nazi regime. In the spring and summer of 1933, the first networks of scientists were formed in several countries to help and support their displaced colleagues. London, Paris and Zurich were the first cities for those seeking help, before New York became the most important place of refuge, because the emigrants had to continue fleeing from the Nazis. The following relief organizations[23] were founded in spring 1933:

- in London, in April 1933, the "Academic Assistance Council" (AAC) was established, renamed the S.P.S.L. (the Society for the Protection of Science and Learning) in 1937[24]; the AAC published the "List of Displaced German Scholars" in 1936; besides William Henry Beveridge, later Lord Beveridge (1879–1963), and Lord Ernest Rutherford (1871–1937),the physicist Leo Szilard (1898–1964)was also involved in the foundation of the AAC; he was a close friend to Albert Einstein and Max von Laue (1879–1960), and, after emigrating from Hungary to Germany in 1920, he had to emigrate again in 1933;
- in Zurich, in the spring of 1933, the "Notgemeinschaft deutscher Wissenschaftler im Ausland" (Emergency Association of German Scientists Abroad) was

[22]Emil Julius Gumbel in the interview with Radio Bremen, April 16, 1959, published in: Vogt (2001), p. 255. (translated by A. B. Vogt).

[23]On the different aid organizations, see Grossmann (1969), and Erichsen (1998).

[24]On the history of the AAC, later the S.P.S.L., see Lord Beveridge (1959), Hirschfeld (1988) and Marks et al (2011).

founded[25]; on December 20, 1935, it moved its main office to London and worked closely with the AAC; the name of this aid organization particularly annoyed the Nazis, but its co-founder, Fritz Haber (1868–1934), deliberately used this name to refer to the "Notgemeinschaft", the earlier "Deutsche Forschungsgemeinschaft" (DFG), which he co-founded in Germany in 1919;
- also from the spring of 1933, the European branch (the Paris Office) of the Rockefeller Foundation began activities in Paris to support German scientists threatened with dismissal and expulsion;
- in New York, in the summer of 1933, the "Emergency Committee in Aid of Displaced German Scholars" was founded, becoming the most important aid organization after 1938.

There was close cooperation among the above-mentioned organizations, including, first and foremost, the exchange of information on those seeking help, i.e., on the emigrants. They exchanged information about which scientists were looking for help, where they were from, at which universities and scientific institutions scholarships or positions were available, and ultimately who could be helped, as well as how and by which means. At an early stage, the staff of the AAC in London began to compile lists, based on questionnaires that the emigrants had to fill out and letters they received, on which - arranged by discipline in alphabetical order - the essential data on the scientists were recorded: Surname, first name, year of birth, marital status, family members; language skills; employment or last employment in Germany; employment since the expulsion in 1933; fields of work or research and special research topics.[26] In spring 1933, Max von Laue regularly sent letters from Germany with the names of colleagues threatened with dismissal or already dismissed, and he was always prepared to write "reference letters" for his expelled colleagues. His reputation was high in the AAC, and his letters helped the emigrants. Printed as internal material, the "List of Displaced German Scholars" was published in 1936, providing a first overview of the extent of the expulsions of German and German Jewish scholars.[27]

The number of scientists included in this "List" varied from discipline to discipline, e.g., in Economics (pp. 26–35), 149 scientists were listed, in Law (pp. 44–50), 112 scholars, and in Mathematics (pp. 51–54), 60 mathematicians. All in all, there were 1,624 scientists, among them 78 female scientists.[28] It should be considered that only those scientists who had lost a position at a German university or similar scientific institution were included in the "List"; industrial mathematicians

[25]See Schwartz (1995) the memories of one of the co-founders of the "Notgemeinschaft" in Zurich, the physician Philipp Schwartz (1894–1977), who was displaced in Frankfurt/M.

[26]See Archive S.P.S.L. in: Bodleian Library, Oxford, box 119/2–119/4 about the organization "Notgemeinschaft"; see the "personal files" of all scholars who were named in the published "List" (1936).

[27]See "List of Displaced German Scholars", London 1936, compiled by the AAC, published in: Strauss (1987).

[28]See Vogt (2014), p. 73.

and lawyers, for example, were not included. No doctoral students or similar young scientists who had completed their studies were included here.

To illustrate, we give two examples from the "List" from the field of mathematics, the entries on Emil Julius Gumbel (1891–1966) and Hilda Pollaczek-Geiringer (1893–1973), the only former female Privatdozent in mathematics at a German university after the death of Emmy Noether (1882–1935):

> **GUMBEL, Dr. Emil J**., a. o. Professor; b. 91., married, 1 child. (English, French, Italian.). 1923/33: Privatdozent, later a. o. Prof. Heidelberg University; since 1933: Lyons University. SPEC.: *Applied Maths.; Statistics; Calculus of Probability; Actuarial Science*. Perm.[29]

> **POLLACZEK-GEIRINGER, Dr. Hilda**, Privatdozent; b. 95., married, 1 child. (English, French). 1921/33: Assistant Institut für Angewandte Mathematik, Berlin University; 1927/33: Privatdozent Berlin University; 1933/34: Prof. Brussels University; since 1934: Dozent Istanbul University. SPEC.: *Applied Maths.; Theory of Probability; Theoretical Mechanics; Practical Analysis; Statics; Geometry*. Temp.[30]

In these entries, "Perm." meant "permanent", but this actually meant an employment up to five years, "Temp.", i.e. "temporarily", meant a limited employment, and "Unpl.". i.e., "unplaced" - which was stated in 1936 by many emigrants, e.g., Otto Blumenthal, Max Dehn, Edmund Landau, Robert Remak (1888–1942) and Issai Schur - meant without any appointment. Of the 60 mathematicians on the "List" in 1936, only 16 had a temporary position, 21 a permanent one, and 23 were "unplaced".

Emil J. Gumbel, as well as Hilda Pollaczek-Geiringer, had to flee for a second time, Gumbel in 1939/40 from the advancing Nazi Army via Marseille, Spain and Portugal to the USA, Pollaczek-Geiringer in 1939 from Turkey to the USA. Max Dehn had to flee further from the invaded Norway, and he too ultimately reached the USA as a safe country of exile. While Edmund Landau (in Berlin) and Issai Schur (in Tel Aviv) died a natural death, Otto Blumenthal perished in the Ghetto and Concentration Camp Theresienstadt on November 13, 1944, and Robert Remak perished in the deportation train to the Death Camp of Auschwitz on November 13, 1942. Both who had fled to the Netherlands became victims of the Shoah.

Open research questions of investigations on exile

The entire extent of the persecution, the expulsions, emigration and the subsequent life paths and careers in the various countries of exile, is still partly a research desideratum. Research on exile is by no means a closed subject of investigation. In order to explain this, we need only look at the figures determined for the emigrated

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[29]Entry in: Strauss (1987), p. 51. (bold and italic in original).

It is remarkable that Gumbel did not mention that he was able to read Russian. In the questionnaire for the AAC, he wrote that, as a stateless person, he could not emigrate to the USSR; at that time (in 1933), the USSR was a potential state of exile and was taken into account by the staff members at the AAC.

[30]Entry in: Strauss (1987), p. 53. (bold and italic in original).

Hilda Pollaczek-Geiringer was, in fact, born in 1893, around about 1936, she was divorced; her first husband, the mathematician Felix Pollaczek (1892–1981), escaped to France and survived during the Nazi occupation thanks to the support of members of the Résistance.

mathematicians and the countries of exile. The "List" (1936) compiled by the AAC contained 60 mathematicians. They emigrated to 15 different countries, eight of them to Great Britain (GB) and 14 to the USA. The first systematic search for the fate of the mathematicians who emigrated was conducted in the late 1960s by Maximilian (Max) Pinl (1897–1987).[31] Together with Lux Furtmüller, he published his investigation in 1973,[32] according to which 127 mathematicians (including five females) emigrated to 16 different countries, among them, five to Palestine/Israel, 20 to the UK, and 60% to the USA. Thirteen of the 127 mathematicians had to emigrate several times. In the exhibition "Terror and Exile", which was shown in 1998 on the occasion of the International Congress of Mathematicians in Berlin, the fate of 130 mathematicians was reconstructed.[33] For our exhibition "Jewish Mathematicians in the German-speaking Academic Culture", we sought to clarify further previously unknown fates.[34]

Those mathematicians who did not want to or could not emigrate in time and those who did not emigrate far enough away and could not save themselves by fleeing the murderers for a second or third time became victims of the Shoah. Representative of these, we may remember Otto Blumenthal (1876–1944), Margarete Kahn (1880–1942) and Felix Hausdorff (1868–1942). Otto Blumenthal had emigrated to the Netherlands, where he was arrested by the occupying forces during one of the infamous razzia, deported to the transitional Westerbork Concentration Camp, and from there to the Ghetto and Theresienstadt Concentration Camp. There, he perished, due to stress, strain and disease, on November 13, 1944.[35] MargareteKahn had received her doctorate in 1909 under David Hilbert (1862–1943) with a thesis on a topological subject (on the study of the shapes of algebraic curves), and then worked as a secondary school teacher at various schools in Berlin from 1929 on. First, she was dismissed from school-teaching, then she was forced out of her apartment in 1941. She had to do forced labour, and, together with her sister, she was deported on March 28, 1942, on the so-called 11. transport train to Trawniki; she was subsequently murdered in Piaski.[36] The tragic fate of Felix Hausdorff is representative of the scientists who committed suicide in the face of the threat of deportation to one of the death camps.[37] In Bonn and Aachen, memorial plaques commemorate Felix Hausdorff and Otto Blumenthal as victims of the Shoah. In Berlin, Rudolstädter Straße 127, a Stolperstein (stumbling stone) was placed in memoriam of Margarete Kahn.

[31]See Pinl (1969ff).

On the background and context of his publications in the years after 1969, and about the opposition to these articles, see Butzer/Volkmann (2006), p. 2 (fn 3) and p. 6 (fn 20).

[32]See Pinl/Furtmüller (1973).

[33]See "Terror and Exile", a catalogue of the exhibition, edited by Brüning et al (1998), and Siegmund-Schultze (1998).

[34]See the catalogues from the exhibitions (German and English), shown between 2007 and 2017, edited by Bergmann/Epple (2009) and Bergmann/Epple/Ungar (2012).

[35]See Felsch (2006) and Felsch (2011).

[36]See König/Prauss/Tobies (2011), pp. 60–65.

[37]Felix Hausdorff committed suicide on 25 January 1942 in Bonn.

On Felix Hausdorff see Purkert (2009, 2010).

4 Live and Work in Exile

The investigation on the highly diverse conditions in the various countries of exile, the possibilities for the emigrants to continue or not continue to be professional scientists, the necessity of having to change one's subject or profession, the striving for recognition and the success or failure of these intentions are still part of the open questions of research on exile. In contrast, "success stories" have often been described in the past.[38] The exceptions among the emigrants - Albert Einstein, Richard Courant, James Franck (1882–1964) - were (and still are) often used to illustrate the fate of scientists expelled from Nazi Germany and Nazi-occupied Europe, but even they had a hard time in exile at the beginning. The true extent of the difficulties of living and working in exile was (and still is) very often hidden, including in the memories of the exiled themselves. If they succeeded in making a new start in exile, these difficulties appeared, in retrospect, to be less significant and worth remembering. Thus, their memories unintentionally contributed to misconceptions about the difficulty of life in exile.

On the basis of the Author's research on Jewish mathematicians in the German-speaking academic world and on the history of Jewish women scientists at Berlin University and the Kaiser Wilhelm Society for the Advancement of Science (KWG),[39] five preconditions are presented below that were necessary in order to continue to work scientifically as scientists (male and female) in exile. If these preconditions were not fulfilled, the efforts to reach a country of exile that would save them could fail, or the emigrants might have had to mourn the abandonment of their scientific work after losing their homeland. So far, no serious differences could be found regarding the gender of the emigrants. The discrimination against female emigrants in exile depended, to a large extent, on the professional conditions that existed for female scientists in the respective country of exile, on how high or low the recognition of female scientists was there. This resulted in better or worse opportunities for female emigrant scientists. The International Federation of University Women (IFWU), and the US and British FWUs (USFWU, BFWU) especially, which were highly respected in the USA and the UK, provided important help for the emigrant women and worked closely with the AAC, the later S.P.S.L.[40]

Apart from the language problem, which was less relevant for mathematicians and physicists than for humanists and social scientists, e.g., historians or sociologists, the following five conditions had to be fulfilled in exile - for (female and male) scientists - in order to be able to continue their scientific work:

[38]See Medawar/Pyke (2001) on displaced scientists who escaped to UK; the title "Hitler's gift" overestimated the "success stories" which are described in the book.
[39]See Vogt (2009, 2012), Vogt (2007) and Vogt (2008).
[40]See letters between the staff members of the AAC and S.P.S.L. and the officers of the BFWU in the Archive of the S.P.S.L.; furthermore, see von Oertzen (2012).

1. They had to be of the "right" age at the time of application or arrival, and, above all, they could not be classified as "too old".[41]
2. They had to have the "right" qualification, i.e., they had to work in a scientific discipline for which there was a growing demand in the country of exile.
3. They had to have the "right" references, i.e., they had to have done their doctorate or worked with scientists known and accepted in the country of exile and received letters of recommendation from them.[42]
4. Certain special knowledge, special skills or the mastery of certain methods that were particularly in demand in the country of exile at the time of arrival were favourable or helpful.
5. They were not allowed to be choosy about the country of exile, academic institutions, or status (fellowship instead of position).

It is immediately evident that emigration was easier for younger mathematicians than for older ones, easier for assistants than for Privatdozenten - especially since this status did not exist at most universities outside Germany -, easier for specialists whose field was in demand in the countries of exile than for those whose special field offered few opportunities for employment. Very often, the chance of being able to continue working as a scientist depended on the circumstances involved, on luck and chance.

This is why "luck" and "coincidence" appear again and again in the memories of emigrants when they described why they were given a position in this or that place, why they were able to continue their scientific work at this or that institution. Emil J. Gumbel, for example, described, in his interview in 1959, his employment at the New School for Social Research in New York (which issued him the necessary affidavit) after his flight from France with the words:

> I was lucky to come to America with a permanent position, unlike many others who went de facto nowhere and many of whom also perished, in the sense that they could no longer continue their scientific work. I was lucky to be a professor at the New School for two years, then four years, thanks to Alwin Johnson. Since the New School was largely made up of emigrants, my first four years of transition were the easiest.[43]

[41]To be of the "right" age was a bigger barrier than gender, because of the limited grants that were available. By definition, these grants were offered mostly to young scholars and postdocs. It was the hope of the aid organizations that these scholarship holders would get an academic position later. Moreover, one has to bear in mind that, during these years, between 1933 and 1945, emigrants were considered to be "too old" when they were about 50 years old.

[42]In the AAC, Max von Laue was highly regarded, and the staff members of the AAC wrote in documents then: "a letter from von Laue !". Similarly, each letter of recommendation written by Albert Einstein was very helpful.

[43]Gumbel, E. J. Interview 1959, in: Vogt (2001), p. 250. (translated by A. B. Vogt).

Alwin S. Johnson (1874–1971), co-founder in 1919 of the New School for Social Research in New York, was that institution's director from 1922 to 1946. In 1933, his idea was to change the New School into a "University in Exile"; E. J. Gumbel was paid by the Rockefeller Foundation during his stay at the New School. About the New School, see Krohn (1987).

Once again, he used the word "luck" (or "fortune") when describing the difficult, even materially difficult, circumstances of his life after his years at the New School ended in 1946, when he was living in New York with his wife and son without regular employment or steady income:

> I was faced with the problem of a new position, ... because here, even more so than in Germany, older people, I was already then, are very reluctant to be employed at universities and colleges. ... But after some scientific publications I was lucky to get people's attention, so that after some time I got a sufficient number of research assignments, which were extended from year to year, and that is also my current situation at Columbia University.[44]

And he used the word "luck" yet again when he explained what he had been working on in his two countries of exile, France and the USA:

> I was lucky to be able to continue my work in France and here exactly in the direction I had begun, mathematical statistics. It's a domain of applied mathematics that has long and wide emissions in many scientific fields.[45]

When E. J. Gumbel gave the interview to Radio Bremen in 1959, many of his emigrant colleagues could still have been interviewed. Gumbel's assumption that many of the emigrants were mostly only able to carry out purely teaching activities[46] was not confirmed by the exile research that began in the 1980s, but many emigrants, especially the younger ones, did have to change their research interests in order to obtain better employment conditions.

The former female Privatdozent at the Berlin University, Hilda Pollaczek-Geiringer (1893–1973), had to flee several times, like E. J. Gumbel. From 1933 to 1934, she worked at the Free University in Brussels, and in 1934, she was appointed professor at the University of Istanbul, giving her lectures first in French and later in Turkish. Because of the politically uncertain situation in Turkey, she emigrated - like many German-Jewish scholars - to the USA in 1939. There, she was offered consecutive positions at two of the top women's colleges, first at Bryn Mawr College (one of the oldest and most famous women's colleges in the USA, and where Emmy Noether also obtained a position), and then, from 1944 to 1959, at

[44]Gumbel, E. J. Interview 1959, in: Vogt (2001), p. 251. (translated by A. B. Vogt).

Gumbel never again received a permanent position at a university in the USA. In the years from 1953 to 1956, he tought each summer semester as a guest professor at the Free University in Berlin (West). In 1958, he published his magnum opus "Statistics of Extremes" (New York: Columbia University Press, 1958). A Russian translation was published in Moscow in 1965, with a foreword written by B. V. Gnedenko (1912–1995), who was teaching as a guest professor at Humboldt University in Berlin (East) in 1954–1955.

[45]Gumbel, E. J. Interview 1959, in: Vogt (2001), p. 253. (translated by A. B. Vogt).

Gumbel did research on floods and meagreness and developed mathematical methods to forecast those - rare and extreme - events. The distribution that he discovered is named after him, the Gumbel distribution. He was first acknowledged among hydrologists, and the Gumbel distribution has recently been used in finance mathematics and climate research as well.

[46]See Gumbel, E. J. Interview 1959, in: Vogt (2001), p. 254.

Wheaton College, Norton, MA.[47] After the early death of her husband Richard von Mises (1883–1953), she edited several of his books. She received her first positions in exile because she had good references, and was welcomed at the University of Istanbul because of her research in applied mathematics. In the USA, thanks to the Women's Colleges, she was at least able to continue her work as a professor of mathematics.

Among those who changed their direction of research - and their name - while in exile was Hermann Otto Hirschfeld (1912–1980), who received his doctoral degree in Berlin in 1934, and who changed his name to H. O. Hartley in his exile in England in 1938. He had studied mathematics at Göttingen and Berlin and received his doctorate for a topic related to the calculus of variations. Immediately after earning his doctorate, he emigrated to Great Britain, where he obtained his first position as a statistician at Harper Adams College, an agricultural science institute. In 1940, he obtained a doctoral degree (Ph.D.), again at Cambridge, this time for a topic related to statistics. From 1946 to 1953, he was a lecturer at University College in London, then he moved to the United States, first teaching at Iowa State University, and then, in 1969, becoming the founder and first director of the Institute of Statistics at Texas A & M University. In recognition of his merits regarding the development of mathematical statistics in the USA, he became President of the American Statistical Association in 1979.[48]H. O. Hirschfeld-Hartley belonged to the young mathematicians who found it comparatively easy to adapt to the different scientific culture in their country of exile. Again, age played a decisive role, but so did his willingness to leave the mathematical field of the calculus of variations, i.e., pure mathematics, and move into the field of mathematical statistics, i.e., applied mathematics. In contrast to E. J. Gumbel, who maintained his interest in the political developments in Germany in exile, Hirschfeld-Hartley wanted nothing more to do with his former fatherland. He was thrown away and expelled, and reoriented himself from then on, and this turning away was also formally shown by his change of name. He is remembered at the Humboldt University of Berlin (the former Berlin University), where the Hirschfeld Lectures have been regularly organized since 2003:

> In his spirit, the Hermann Otto Hirschfeld Lectures at Humboldt-Universität are given since 2003 in memory of an excellent scientist and an advocate of quantitative methods.[49]

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[47]On Hilda Pollaczek-Geiringer, married von Mises, see Richards (1987), Binder (1992, 1995), Siegmund-Schultze (1993), Vogt (1994), Vogt (2007), espec. pp. 171–183, Bergmann/Epple (2009), espec. p. 56, 173, 175, 209, 214.

[48]See Pinl (1969), p. 168f, and the obituary written by Smith (1981).

H. O. Hirschfeld was not included in the "List" (1936) because he was a former doctorate student, and had not lost an academic position. But he was included in the biographical dictionary of emigrants; see Strauss/Röder (1983), vol. II, Part I.

[49]See the homepage https://www.wiwi.hu-berlin.de/de/forschung/irtg/events/2019/hirschfeld-lecture-series-2019 (last access 6 June 2020).

About him it is written:

"The **Lecture** Series is named after the remarkable German-American statistician Hermann Otto **Hartley** (known as HOH). Born H.O. **Hirschfeld**, he completed his Ph.D. in mathematics at

Did mathematicians return to the places where they worked, were they able once again to be physically present at their universities, or did they only - after many decades of delay - return in memory? After the reopening of the universities in the four Occupation Zones of Germany, most of the scientists who had escaped into exile, whether professors or Privatdozenten, were not asked to return to the universities concerned. On the contrary, isolated proposals to remigrate offered by emigrants were usually brusquely rejected. There is still a considerable need for detailed research into how these developments took place. Initial studies have been conducted for the University of Göttingen and the Kaiser Wilhelm/Max Planck Society.[50] Pinl/Furtmüller found out that only four of 82 emigrants returned, less than 5%. One returned to Vienna in 1947, the other three, in the 1950s, came from their countries of exile, Turkey, India and the USA, to the Federal Republic of Germany and to the Free University of Berlin (West).[51]

An investigation on the Berlin University, later Humboldt University of Berlin (East), has shown that there, too, the emigrants were not recalled, but that a few remigrants were working at some faculties of the university, among them physicists, but no mathematicians.[52] Most of them settled in the Soviet Occupation Zone, the later G.D.R., because of their political beliefs, but they were initially received and tolerated by the majority of their colleagues with great scepticism and aversion. Nonetheless, they used their international experience and contacts to improve teaching and rebuild international relations. Vera Friedländer (1928–2019), who later became a professor of German studies and a writer, reported in her memoirs that remigrants were a topic of conversation even at the pre-studies institution.[53] They aroused curiosity, raised questions about the circumstances of exile and return, and were very "different" from the other professors. She especially remembered Alfred Kantorowicz (1899–1979), with whom she wrote her diploma thesis on Hans Fallada (1893–1947) in 1955, and whose assistant she could have become had she not declined due to pregnancy.[54]

As different as the exile experiences were, so were the scientific fields in which the remigrants worked, as well as their achievements in teaching and research. The fact that they were scholars who had been expelled from Germany, who had come to the Soviet Occupation Zone of their own free will and who were highly motivated to help build up the university was rarely discussed "during the lifetime of the G.D.R." An opportunity was lost, not least in providing ideas for future exile and remigration research. At that time, many contemporary witness interviews could have been conducted.

Humboldt-Universität in 1934. Shortly thereafter, HOH, who was of Jewish descent, emigrated to England where he also changed his name a few years later." (bold in original).

[50]See Szabó (2000), and Vogt (2002), Schüring (2006) and Gedenkbuch (memorial book) by Rürup (2008).

[51]See Pinl/Furtmüller (1973), p. 142.

[52]See Vogt (2012), pp. 170–175.

[53]See Friedländer (2009), p. 179.

[54]See ibid., p. 225 and p. 232.

According to current knowledge, only a few of the exiled scientists really wanted to return to Germany. These were usually those who were politically active before and after 1933 and who now wanted to help build a “new”, or a “better” Germany. The mathematician Emil Julius Gumbel, for example, who was expelled from Heidelberg, was very disappointed that “his” university did not ask him to return. Further research is needed on the remigration, whether or not it took place, and on the behaviour of the universities and colleges within the context of the so-called “compensations”. One source is letters from emigrants to their colleagues in Germany, which can be used to reconstruct the situations, thoughts, hopes and intentions of those involved.

Only one example is given as representative. Max Dehn (1878–1952), who managed to escape from Norway to the USA in October 1940, wrote a letter to his former professional organization, the German Mathematical Society [Deutsche Mathematiker-Vereinigung (DMV)], in August 1948, explaining why he could not become a member of the DMV again:

> Dear Mr. Kamke,
>
> thank you for your invitation to join the newly founded Deutsche Mathematiker Vereinigung.
>
> I don’t feel any resentment at all. As you may possibly know, I am again in close contact with a number of mathematicians living in Germany, mainly of course with those who were particularly close to me.
>
> But I cannot rejoin the German Mathematical Society. I have lost confidence that such a society if necessary will act differently in the future than it did in 1935. I'm afraid that it would not resist an unjust sanction coming from outside. The D.M.V. has no such immense values to supervise. The fact that it did not dissolve in 1935, and that not a large number of mathematicians resigned, provokes my hostile attitude. I'm not afraid that the new D.M.V. will throw out Jews again, but perhaps soon it will be so-called communists, anarchists or “coloured people” … (sic).
>
> Your very devoted.
>
> Max Dehn.[55]

In individual cases, emigrants were invited to take part in guest lectures or talks, e.g., E. J. Gumbel at the Free University of Berlin (West) from 1953 to 1956 each summer semester.[56] But any discussion about the “dark times”, as the Nazi period was called in those years, was avoided, and it must remain an open question as to whether this was because of shame and a protective feeling towards the people invited or because of the Germans’ own need to protect themselves from their own memories. There are still many unanswered questions about the history of Jewish

[55]Max Dehn to Erich Kamke (1890–1961), 1948–1952 President of the DMV, 13.8.1948, in: Max Dehn Papers, box 2, No. 55, Archives of American Mathematics Austin, The University of Texas in Austin; quoted in: Siegmund-Schultze (1998), p. 318. (underlined in the original).
[56]On Gumbel at the Free University of Berlin (West) see Vogt (2021), pp. 152–163.

mathematicians before 1933, during the Nazi era, and after May 8, 1945 - the day of the unconditional surrender of Nazi Germany. Research questions concern the reconstruction of the traces left by Jewish mathematicians before and after their emigration and their reasons for not returning, as well as how they dealt with each other after 1945. This should be an important topic for any mathematical seminar and mathematical institute, for any other scientific institution and university, that is aware of the responsibility of "Remembering against forgetting".

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Czechoslovakia – A Good Place to Live? (Immigration and Emigration from the Viewpoint of Mathematicians)

Martina Bečvářová and Jindřich Bečvář

Abstract

The article, based on the study of surviving archive sources available in the Czech Republic and abroad, as well as diverse secondary literature, deals with four typical cases of emigration from Bohemia (1880s), resp. Czechoslovakia (1910s/1920s, 1930s and after 1945), and two typical cases of immigration to Czechoslovakia (1920s and 1930s) from the viewpoint of mathematicians and their communities living in Bohemia, resp. Czechoslovakia. It describes the most important political, economic, social, cultural, religious and nationalistic reasons behind the decision to immigrate or emigrate, compares these six migration waves, and analyses their influence and impact on the development of the mathematical community, teaching activities, and research both within the Czech lands and on the international scale.

Keywords

Emigration · Immigration · Czech lands · Czechoslovakia · Mathematicians · 19th century · 20th century

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1 Introduction – A Historical Background

By emigration or immigration, we usually mean the act of leaving a resident country or a place of residence with the intent to settle elsewhere. Historically, there have been and still are many reasons for emigration, such as, for example, a lack of employment or educational opportunities, lack of political or religious rights, persecution or intolerance based on race, religion, gender or sexual orientation, threat of arrest or punishment, oppressive legal or political conditions, wars, terrorism, religious or cultural fights, overpopulation, shortage of farmland, lack of water, foods, and basic goods … Emigration usually means changing one's country of residence for a prolonged period, possibly as long as one's whole life, and usually entails changing your language of communication, cultural environment, and nationality, and possibly even losing contact with your homeland, relatives, and cultural or religious roots … Problems and questions connected with migration have long been, and continue to be in the present day, very topical and difficult, and they are constantly under discussion by politicians, economists, sociologists, historians and laypersons alike, because unknown situations, cultures, religions and habits tend to cause anxiety in people.

In the past, the Czech lands (especially Bohemia and Moravia), which are in the heart of Europe, have suffered from many large waves of emigration for religious, political or economic reasons.

Significant waves of emigration from the Czech lands usually followed after violent political and religious changes. The two biggest waves occurred during and after the Hussite period (15th century) and after the defeat of the Estates Uprising (1620), when tens of thousands of people (the so-called Bohemian Brethren) left the Czech lands and emigrated to Protestant Europe or America. The most famous Czech emigrant was Jan Amos Komenský (*Ioannes Amos Comenius*; 1592–1670), a Czech pedagogue, philosopher and theologian, and the father of modern education. He served as the last bishop of the *Unity of the Brethren* before becoming a religious refugee, and was one of the earliest champions of universal education. He lived and worked in other regions of the Holy Roman Empire and other European countries (Sweden, Poland, Transylvania, England, Hungary, and the Netherlands). He led schools and advised governments across Protestant Europe through the middle of the seventeenth century.

Another type of mass emigration from the Czech lands that occurred for economic reasons was the result of demographic growth and land shortage in the second half of the 19th century. Czech emigrants went mainly to the USA, but also to Russiaand the Balkans. The majority of those who chose to leave during these waves of emigration tended to be the most educated, most capable, most courageous and hardest working people, meaning that the Czech lands lost a significant portion of their most productive citizens.[1]

[1]For more information on the history of the Czech lands (Bohemia, Moravia), resp. Czechoslovakia, see LeCaine Agnew, Hugh. 2013. *The Czechs and the Lands of Bohemian Crown*. Hoover Press, Stanford; Pánek, Jaroslav, and Oldřich Tůma et al. 2019. *A History of the Czech Lands*. Second edition, Karolinum Press, Charles University, Prague.

Based on a study of surviving archival sources available in the Czech Republic and abroad, as well as diverse secondary literature, we will deal with four typical cases of emigration from Bohemia (1880s), resp. Czechoslovakia (1910s/1920s, 1930s and after 1945), and two typical cases of the immigration to Czechoslovakia (1920s and 1930s) from the viewpoint of mathematicians and their communities living in Bohemia, resp. Czechoslovakia. We will describe the most important political, economic, social, cultural, religious and nationalistic reasons behind the decision to immigrate or emigrate, compare these six migration waves, and try to analyse their influence and impact on the development of the mathematical community, teaching activities, and research both within the Czech lands and on the international scale.

2 Emigration from Bohemia in the Second Half of the 19th Century

In the middle of the 19th century, Bohemia became the industrial backbone of Austria. The growing efforts to convert the country from a scattered feudal state into a centralized unit and improve agricultural and industrial production required the rapid development of technical schools. In this respect, an important role was played by the teaching of mathematics, in particular, geometry, which became an integral part of the educational landscape. The expansion of the technical universities required the development of secondary education in view of increasing demands on the professional readiness of both teachers and students. This pressure led naturally to the creation of new types of secondary school (technical secondary schools, upper forms of grammar schools, schools of commerce) and a reform of classical grammar schools. The prestige of exact sciences and technologies became evident. At the same time, it led to an increasing number of vacancies for teachers and a tightening up of the demands on their preparation. For these reasons, teaching methods at "classical" universities were reformed, so as to focus on the education of prospective teachers, doctors and lawyers.

In the second half of the 19th century in Bohemia, due to the rise of nationalistic movements, the Czech and German communities (who had long lived together) separated. This separation was also reflected in science and education. An important feature of that period was the process by which Czech science was "becoming independent". It was accompanied, on the one hand, by protracted national conflicts and, on the other hand, by the expensive construction of new schools, the establishment of new associations, and the development of specifically Czech scientific terminology, journals and monographs. As a consequence, finances were drained and the development of Czech science was delayed.

Up to the end of the 1850s, all secondary schools and universities were German. It was not until 1861 that the first Czech secondary schools were built. In the period between 1861 and 1865, some subjects at state secondary schools were taught in Czech, while others remained in German. By the second half of the 1860s, German and Czech secondary schools coexisted, operating under the same standards. Thus, the undergraduates of the Czech stream of education who entered universities started to demand lectures in their mother tongue. In the 1860s, the efforts of Czech political representatives and intellectuals, as well as the movement of university students to have their studies conducted in the Czech language, led to the establishment of mathematical lectures in Czech at Prague Technical University (in 1864) and Prague University (in 1871). For more information, see [2].

In the 1870s and 1880s, the number of mathematicians and teachers of mathematics rapidly increased. There were many Czech candidates eager to teach mathematics at secondary and technical schools and universities who were without regular positions and income. They could not find work as teachers at secondary schools. It is not surprising that some of them (for example, Th. Monin, J. Pexider, C. Plch, F.V. Splítek, A. Studnička, V. Šak, A.V. Šourek, and K. Zahradník) went abroad, especially to the Balkan Peninsula: Croatia, Slovenia, Serbia, Bosnia and Herzegovina and Bulgaria, i.e., to the lands that had gained independence, either from the Ottoman Empire or the Austro-Hungarian Empire, and had started to build their own national states, cultures, and scientific, educational and health systems, as well as scientific and cultural societies.[2]

In the Balkans, a region that is mostly inhabited by Slavic ethnic groups (Bulgarians, Macedonians, Serbians, Croatians, Montenegrins, Bosnians, and Slovenes), Romanians, Greeks, Turks, Albanians and a few minorities, and where the dominant religion was Orthodox Christianity, followed by Catholicism and Sunni Islam, Czech mathematicians (usually of Roman Catholic descent) quickly obtained good regular positions and started to play an important role in the development of a "national" mathematics, mathematical education and mathematical associations.

They mastered the foreign languages and began to create curricula for teaching mathematics and descriptive geometry at secondary schools and universities. They participated actively not only in the development of regional educational systems, but also in scientific work in mathematics, forming the first local scientific communities. For teachers, they wrote the first methodological manuals in their mother tongues. For their pupils, they created the first brief teaching texts and collections of mathematical exercises (initially published in the lithographical form or within annual reports of secondary schools). During the first few years, they translated Czech textbooks and created mathematical terminology. In the second phase of their "missions" – usually at the end of the first decade of their stays – they were inspired by Czech models and wrote new textbooks for secondary schools and universities. These textbooks were used until the end of WWI. On the basis of their good experience in Bohemia, they led local mathematical communities to the unification of professional associations and initiated the publication of professional, educational and popularisation periodicals. In addition, they participated in international promotion of the results of professional and pedagogical research.

[2]For more information about the role of Czech emigrants in the Balkans, especially in Bulgaria, see Rychlík, Jan. 2000. *Dějiny Bulharska* [History of Bulgaria]. Lidové noviny, Praha; Gregor, Dobromil, and Marcel Černý. eds. 2008. *Úloha české inteligence ve společenském životě Bulharska po jeho osvobození* [The Role of Czech Intelligentsia in the Social Life in Bulgaria after its Liberation]. Velvyslanectví Bulharské republiky v České republice, Praha.

Some of them came back to the Czech lands and worked as professors at prestigious secondary schools or universities. Unfortunately, they are forgotten in their homeland, but their names and activities are well known and recognized in the Balkans.[3]

The list of Czech mathematicians who lived and taught in the Balkans, including where they worked and their periods of activity, is as follows:

Croatia

Jan Pexider (1831–1873)	Zagreb	Gymnasium	1864–1873
Josef Laun (1837–1915)	Rijeka Zagreb	Gymnasium	1864–1868
Karel Seeberg (1835–?)	Vinkovci Sinj	Gymnasium	1865–1867
Josef Silvestr Vaněček (1848–1922)	Osijek	Real school	1873–1875
Karel Zahradník (1848–1916)	Zagreb	University	1875–1899

Slovenia

Rudolf Schnedar (1828–1862)	Ljubljana	Real school	1860–1862
Josef Baudiš (1825–1898)	Gorizia (Italy, today)	Gymnasium	1860–1864
Josef Finger (1841–1925)	Ljubljana	Real school	1870–1874

Bosnia and Herzegovina

Cornelius Plch (1838–1889)	Travnik (today Tornik, Serbia)	Gymnasium	1870s up 1889
Alois Studnička (1842–1927)	Sarajevo	Technical school	1893–1907

Bulgaria

Antonín Václav Šourek (1858–1926)	Sliven Plovdiv Sofia	Secondary school Secondary school University	1880–1881 1881–1890 1890–1926
František Vítězslav Splítek (1855–1943)	Svitov Salonica (Greece, today) Sofia Gabrovo Plovdiv	Secondary school Secondary school Secondary school Secondary school Secondary school	1880–1883 1883–1888 1888–1889 1889–1891 1891–1915

(continued)

[3]For example, the textbook by Karel Zahradník (*Geometrijska vježbenica za više razrede srednjih učilišta*) [Geometric Collection for Upper Classes of High School], written in 1896, was published in 2003. His photograph was used in 2000 for the diploma of the Croatian Ministry of Education and Sport delivered to the winners of the Mathematical Olympiad. Czech mathematicians working in Bulgaria are honored by the local professional community as "founding fathers".

Theodor Monin (1858–1893)	Sliven Sofia	Secondary school University	1881–1886 1889–1891
Vladislav Šak (1860–1941)	Sliven Sofia	Secondary school Secondary school University	1882–1886 1886–1907 1891–1894 and 1907–1908

The Czech mathematical community was able to export its successful activities out of the Czech territory, particularly to the Balkans. Czech mathematicians played an important role in the development of "national" mathematical communities, scientific societies, and educational systems. For more information, see, for example, [3, 4, 6].

Some Czech mathematicians also went to Western Europe and countries of the Austro-Hungarian Empire. They were looking for better careers and the opportunity of both broadening the horizon of their knowledge and making contact with the best mathematical centres of Western Europe, as well as the possibility of publishing their scientific and popular works there.

The list of prominent Czech mathematicians working and teaching in Western Europe and countries of the Austro-Hungarian Empire, including where they worked and their periods of activity, is as follows:

Galicia

Čeněk Hausmann (1826–1896)	Lvov	Technical University	1852–1857
Václav Láska (1862–1943)	Lvov	Technical University	1895–1911

Hungary

Johann Josef Partl (1802–1869)	Budapest	Real school	1851–1861
Čeněk Hausmann (1826–1896)	Budapest	Technical University	1857–1863

Austria

Josef Šetlík (1833–1860)	Klagenfurt	Secondary school	1856–1858
Gustav Skřivan (1831–1866)	Vienna	Secondary school	1858–1863
Johann Josef Partl (1802–1869)	Vienna	Gymnasium	1862–1867
Čeněk Hausmann (1826–1896)	Graz	Technical University	1864
Vavřinec Jelínek (1844–1898)	Baden Wiener Neustadt	Secondary school Secondary school	1872–1873 1873–1883
Jan Marek (1834–1900)	Wiener Neustadt	Secondary school	1874–1889
Emil Weyr (1848–1894)	Vienna	University	1875–1894
Karel Pelz (1845–1908)	Graz	Secondary school, Technical University	1875–1896
Josef Finger (1841–1911)	Vienna	Secondary school University Technical University	1876–1878 1876–1890 1878–1911
Emanuel Czuber (1851–1925)	Vienna	Technical University	1891–1925
Jan Sobotka (1860–1931)	Vienna	Secondary school, Technical University	1894–1896 1896–1899

Switzerland

Matyáš Lerch (1860–1922)	Freiburg	University	1896–1906

Czech or German mathematicians who were employed at German schools in Germany, Switzerland or other countries of the Austro-Hungarian Empire were able to teach, engage in research and publish their professional works because they were in a much more developed cultural environment than their colleagues who stayed in the Balkans. They did not have to worry about writing textbooks, creating terminology, setting up professional journals, organizing local communities, etc. They had enough time for scientific work.

After some time, some of them returned to the Czech lands and worked as professors at prestigious secondary schools or universities. They brought to their home modern mathematical research and the latest mathematical trends or teaching methods. They established contacts and collaborated with their foreign colleagues (such as, for example, Č. Hausmann, V. Láska, M. Lerch, K. Pelz, G. Skřivan, and J. Sobotka).[4] Others obtained good positions abroad and stayed there, becoming respected mathematicians outside of the Austro-Hungarian Empire thanks to their results (for example, E. Czuber, J. Finger, and E. Weyr).[5] It should be added that they all remained in close contact with their homeland for their whole lives. For more information, see [2].

[4]For more information on above-mentioned mathematicians, see Bečvářová, Martina. 2011. *Václav Láska v Polsku* [Václav Láska in Poland], pp. 149–158, in Bečvář, Jindřich, and Martina Bečvářová. eds. 2011. *32. mezinárodní konference Historie matematiky*, *Jevíčko 26. až 30. 8. 2011*, Matfyzpress, Praha; Čupr, Karel. 1923. Profesor Matyáš Lerch. *Časopis pro pěstování matematiky a fysiky* 52: 301–313; Frank, Ludvík. 1953. O životě profesora Matyáše Lercha [On the Life of Professor Matyáš Lerch]. *Časopis pro pěstování matematiky* 78: 119–137; Sklenáriková, Zita. 2007. *Zo života a diela Karla Pelze* [From the Life and Work of Karel Pelz], pp. 197–215, in Fuchs, Eduard. ed. 2007. *Matematika v proměnách věků IV* [Mathematics through the Ages IV]. Series History of Mathematics, volume 32, Akademické nakladatelství CERM, Brno; Slavík, Jan. 2001. *Životní příběh prof. Gustava Skřivana* (*1831–1866*) [The Life Story of Gustav Skřivan (1831–1866)], pp. 245–254, in Bečvář, Jindřich, and Martina Bečvářová. 2011 32. mezinárodní konference Historie matematiky, *Jevíčko 26. 8. až 30. 8. 2011*, Matfyzpress, Praha; Kašparová, Martina and Zbyněk Nádeník. 2010. *Jan Sobotka* (*1862–1931*). Series History of Mathematics, volume 44, Matfyzpress, Praha.

[5]For more information on the above-mentioned mathematicians, see Bečvářová, Martina. 1999. *Z historie Jednoty* (*1862–1869*) [From the History of the Union(1862–1869)]. Series History of Mathematics, volume 13, Prometheus, Praha; Bečvář, Jindřich, and Martina Bečvářová, and Jan Škoda. 2006. *Emil Weyr a jeho pobyt v Itálii v roce 1870/71* [Emil Weyr and His Stay in Italyin 1870/71]. Series History of Mathematics, volume 28, Nakladatelství ČVUT, Praha; Hykšová, Magdalena. 2011. *Filosofická pojetí pravděpodobnosti v pracích českých myslitelů* [Philosophical Conceptions of Probability in the Works of Czech Thinkers]. Series History of Mathematics, volume 51, Matfyzpress, Praha.

3 Emigration from Czechoslovakia (1910s and 1920s)

During WWI, Bohemia was at a remove from the frontline battlefields. Only a few Czech and German mathematicians and professors of mathematics were forced to interrupt their careers or studies to go into battle (conversely, many young students of mathematics had their lives upended by the war). On October 28, 1918, the independent Czechoslovak Republic was founded and became a democratic republic in the centre of Europe, with Czechs, Germans, Slovaks, Ukrainians and other citizens living together. Its official borders and independence were confirmed by the Versailles Agreement, and were later enlarged thanks to challenging discussions at the international peace conference (January – July 1919) and plebiscites in 1920 and 1921. Prague became the capital city of the new republic.

There were many national, religious, economic and social problems in Czechoslovakia from 1918 until 1939. After its creation, Czech high and secondary schools, scientific and cultural communities and professional associations developed rapidly. In Czechoslovakia, in contrast to other non-German parts of the former Austro-Hungarian Empire, German high and secondary schools, professional associations, scientific and cultural communities were not abolished. For example, the German University in Prague became an equal, recognized and respected state university. It was not reduced, oppressed or financially suppressed by the new republic. Actually, it served as the only official state minority university in a post-war Europe that was being divided into states based on a supranational principle. It was a relatively small but significant scientific and pedagogical workplace in Europe, maintaining this position until the beginning of WWII.[6]

But soon after the creation of the Czechoslovak Republic, some German-speaking mathematicians and physicists decided that they did not wish to live and work in a country where the German population would be a respected minority, but the "Czechoslovak" language would be the so-called state language. Although they had prestigious positions in Czechoslovakia with good perspectives, they decided to emigrate and live in the German cultural area. They moved to Austria and Germany (for example, Gerhard Hermann Waldemar Kowalewski (1876–1950),[7] Joseph Fuhrich (1897–1945) and Amalia Weizsäcker (1898–?) went to Dresden, Anton Lampa (1868–1938) to Vienna and Roland Weitzenböck (1885–1955) to Graz). Some obtained good positions at universities or ministries, while others continued in their studies and later became financial specialists. Usually, they discontinued their contact with colleagues from Czechoslovakia and had no interest in the news from Prague. For more information, see [8].

[6]For more information about the history of Czechoslovakia, see Pánek, Jaroslav, and Oldřich Tůma et al. 2019. *A History of the Czech Lands*. Second edition, Karolinum Press, Charles University, Prague.

[7]For more information, see Bečvářová, Martina. 2018. Gerhard Hermann Waldemar Kowalewski and his two Prague periods. *Antiquitates Mathematicae* 12: 111–159.

4 Immigration to Czechoslovakia (1920s)

After the October Revolution in Russia in 1917, many well-educated and wealthy Russians immigrated to Czechoslovakia and started to live, work and study there. This was the so-called white emigration from Russia.

Soon, they became regular Czechoslovak citizens, and some of them obtained new positions at Czech universities and secondary schools as assistants, teachers or researchers, their education and knowledge of the language making the transition easy. Some of them worked for the Russian minority living in Czechoslovakia.

Many students who had been born in the former tsarist Russia ended up studying at Charles University in Prague during the interwar period. They accounted for 10 to 15 percent of the student body. Some of them belonged to a large group of "Russian" emigrants. Over time, many of them became Czechoslovak citizens and came to consider Czechoslovakia as their home. Others (especially Jews), having finished their studies in Prague, returned to their homelands or moved on to Western Europe or the USA.[8]

Very few students from the former tsarist Russia or the Soviet Union studied at the German University in Prague in the interwar period. The main reason for this was the language barrier. They made up less than three percent of all students.[9]

Let us now mention two typical cases of Russian mathematicians who found their new home in Czechoslovakia and who were able to continue in their mathematical research despite not being among the most famous or most revered of the Russian mathematicians.

The first of them was Eugen Bunickij (1874–1952), who studied and worked at the University of Odessa. At the beginning of the 1920s, he emigrated to Czechoslovakia. In 1931, he became a regular lecturer of mathematics at Charles University in Prague. When the Nazis came to Prague and destroyed the Czechoslovak Republic (1939), he was given a pension and was forced lived in very poor economic conditions throughout the war. From 1945 until 1952, he held mathematical lectures in Czech and Russian at Charles University in Prague. He was mainly interested in analysis.[10]

The second Russian mathematician who made his career in Czechoslovakia was Nikolaj Podtjagin (1887–1970). He studied in Kharkiv and Paris, and worked in Kharkiv after his studies. In 1921, he emigrated to Istanbul, and later to Prague. There, he worked as a specialist in financial mathematics from 1932 until 1939.

[8]For example, at the Faculty of Science of Charles University in Prague, 115 students (born in the territory of the former tsarist Russia) underwent a doctoral procedure between 1920 and 1939. The dissertations were written in Czech, French, German, English or Russian (9 dissertations were from mathematics). For more information, see [15].

[9]For example, at the Faculty of Science of the German University in Prague, 21 students (born in the territory of tsarist Russia) underwent a doctoral procedure between 1920 and 1939. The dissertations were written only in German (1 dissertation was from mathematics). For more information, see [16].

[10]For more information, see Bílý, Josef. 1953. Eugen Bunickij zemřel [Eugen Bunickij Died]. *Časopis pro pěstování matematiky a fysiky* 78: 287–290.

In 1938, he became a doctor of mathematics in Prague.[11] From 1939 until 1951, he was a specialist in financial mathematics in Bratislava (now Slovakia). From 1951 until 1953, he was a regular teacher of mathematics at the Technical University in Bratislava. He was interested in problems of insurance, integration theory, the theory of functions and the theory of special rational curves. He wrote his articles in Russian and French.[12]

In the 1930s, when life in Central Europe began to be plagued by nationalistic and economic problems, some of the Russian emigrants decided to emigrate to France or the USA, believing they would secure better conditions for their work and activities there.

5 Immigration to Czechoslovakia (1930s)

As mentioned earlier, the Czechoslovak Republic was a democratic republic in the centre of Europe until 1939. It is no surprise that, starting in the 1920s, its schools and universities (especially the German University in Prague) attracted foreign German-speaking students, who were coming from Hungary, Latvia, Lithuania, Poland, and Ukraine, as well as from Germany and Austria later on. In Prague, they found low school fees and costs of living, good transportation possibilities, a democratic and multicultural atmosphere, religious and racial tolerance, and many famous professors (for example, the German University in Prague alone was home to Ludwig Berwald, Rudolf Carnap, Carl Isidor Cori, Philipp Frank, Hans Hirsch, Karl Löwner, August Naegle, Georg Alexander Pick, Leo Wenzel Pollak, Ernst Georg Pringsheim, Karl Maria Swoboda, Moritz Winternitz, and Wilhelm Wostry). The fact that there was no "numerus clausus" for Jewish students and poor students who needed social benefits or scholarships also played a very important role.[13]

Until 1939, the Czech and German mathematical communities in Czechoslovakia were not directly affected by national and religious problems resulting from the increasing strength of fascism or domestic conflicts between liberal and social democratic groups and national and anti-Semitic groups. People of various nationalities (Czech or German-speaking citizens of the Czechoslovak Republic, Austrians and Germans, other European citizens), people of different religions (Catholics, Protestants, Jews and secular folk), people of various political

[11]N. Pondtjagin wrote his dissertation, entitled *Quelques remarques sur la méthode de Lidston dans l'assurance sur la vie*, and it was reviewed by Professors Emil Schoenbaum (1882–1967) and Miloš Kössler (1884–1961). For more information, see [15].

[12]For more information, see Oboňa, Jozef. 1967. Životné jubileum doc. RNDr. Nikolaja Podtjagina [Nikolaj Podtjagin Octogenarian]. *Časopis pro pěstování matematiky* 92: 239–240.

[13]For more information about the history of Charles University and the system of education in pre-war Czechoslovakia, see, for example, Havránek, Jan, and Zdeněk Pousta eds. 1998. *Dějiny Univerzity Karlovy 1918–1990* [History of Charles University 1918–1990]. Volume 4, Univerzita Karlova, Praha.

affiliations (democrats, communists, Sudeten German Party members, Zionists and people with no interest in politics at all), people of varied social backgrounds and people with different relationships to Czechoslovakia actively and effectively collaborated together. For them, the most important thing was their love for mathematics, mathematical studies, results and achievements, which fascinated, fulfilled and united them much more than other matters could divide them. For more information, see [1, 8, 9, 12].

In the 1930s, mathematicians in Czechoslovakia did everything they could to help their colleagues who been forced to abandon their positions in Germany and Austria [for example, Felix Adalbert Behrend (1911–1962), Rudolf Carnap (1891–1970), and Maxmilian Pinl (1897–1978)]. Some of these folk obtained new regular positions at the German University in Prague, others worked as specialists in banks and private companies or as private teachers.

At the same time, Czechoslovak universities admitted students who had not been able to finish their studies in their homelands for many political, ideological or religious reasons [for example, Elias Altmann (1900–?), Schaia Benjaminowitsch (1897–?), Lipman Bers (1914–1993), Arthur Erdélyi (1908–1977), Ovsejus Rutstein (1904–?), and Johannes Wegener (1910–?)]. As a result, they were able, without any problems, to finish their basic studies, discuss their Ph.D. theses, and write and publish their first articles. Unfortunately, some of them returned to their homelands, hoping to resume their normal lives, only to be murdered during WWII. Only two of them (Lipman Bers and Arthur Erdélyi) successfully emigrated, enabling them to continue their mathematical research and fashion highly successful careers that turned them into world-famous mathematicians after WWII. For more information about their personal destinies, Praguestudies and mathematical results, see [7, 8].

Between WWI and WWII, Czechoslovak universities were open to foreign students for basic and undergraduate studies, but they were very conservative in recognizing diplomas from foreign universities [as experienced by Arthur Beer (1900–1980), Josef Alexander Flexer (?–?), and Wolfgang Sternberg (1887–1953)] and in establishing either ordinary or extraordinary teaching positions for immigrants. Subsequently, many foreign students approached Czechoslovakia only as a temporary transfer station within the larger journey to better positions in the USA, Canada, Great Britain, France, Switzerland, Asia or South America. For more information, see [8, 10–14].

6 Emigration from Czechoslovakia (1930s)

At the end of the summer of 1938, the escalation of conflicts between certain German professors and the Czechoslovak government exploded. Some German specialists and professors (although no mathematicians!) left Prague and went to Nazi centres, for example, Vienna and Munich, waiting there for Adolf Hitler's instructions about what to do in Prague. It was a very difficult time for the Czechoslovak Republic, as well as its institutions and citizens.[14]

At the end of 1938 and the beginning of 1939 (before the German Nazis came to Prague), Jewish professors, private teachers, assistants and students, as well as democratically-minded or leftist-oriented people, were dismissed from their positions and lost their rights to teach, do research or study.[15]

After March 1939, some Czech and German mathematicians successfully emigrated abroad, saving their own lives and those of their families [for example, Felix Adalbert Behrend (1911–1962), Lipman Bers, Rudolf Carnap, Arthur Erdélyi, Philipp Frank (1884–1966), Paul Kuhn (1901–1984), Karl Löwner (1893–1968), Josefina Mayer (1904–1986), Leo Wenzel Pollak (1888–1964), Emil Schoenbaum, and Arthur Winternitz (1893–1961)]. They got visas to travel to the USA, Great Britain, Irelandor South America, and had enough money and professional contacts to receive offers for regular work there. They obtained their new jobs at secondary schools, local universities, prestigious universities, scientific institutes or state offices, thanks to the help of their colleagues, friends and relatives who were settled abroad or to the activities of the British Committee for Refugees from Czechoslovakia and the Society for the Protection of Science and Learning. Most of them made good professional careers in the USAor Great Britain. For more information about their lives and achievements, see [1, 5, 7, 8].

7 The Situation During and Shortly After WWII

During WWII, some Jewish mathematicians from Czechoslovakia were murdered by the Nazis in concentration camps or ghettos [for example, Ludwig Berwald (1883–1943), Hilda Falk (1897–1942), Walther Fröhlich (1902–1942), Emil Nohel (1886–1944), Georg Alexander Pick (1859–1942) and Josef Rezek (1902–1945)]. Some of them could have immigrated to Great Britain, South America or Asia because they had visas, money and foreign contacts, but they believed that the Czechoslovak Republic was the best place for them to live their lives, as well as that

[14]For more information about the history of Czechoslovakia, see Kárník, Zdeněk. 2000, 2002, 2003. *České země v éře První republiky* (*1918–1938*) [The Czech Lands in the Period of the First Republic(1918–1938)], three volumes, Libri, Praha; Pánek, Jaroslav, and Oldřich Tůma et al. 2019. *A History of the Czech Lands*. Second edition, Karolinum Press, CharlesUniversity, Prague.

[15]For more information about the persecution of Jews in Czechoslovakia from 1938 until 1939, see, for example, Hahn, Fred. 1994. Židé a druhá Česko-slovenská republika [Jews and the Second Czechoslovak Republic]. *Střední Evropa* 10: 190–196, Kárný, Miroslav. 1989. Politické a ekonomické aspekty „židovské otázky " v pomnichovském Československu [Political and Economical Aspects of "Jewish Question" in Czechoslovakia after Munich Pact]. *Sborník historický* 36: 180–183. Many archival documents are also available on the web page http://www.holocaust.cz/cz2/history/jew/czech/prot [30.1.2020].

The situation at the German University in Prague is analysed in the book by Míšková, Alena. 2002. *Německá* (*Karlova*) *univerzita od Mnichova k 9. květnu 1945* [German (Charles) University from Munich to the 9th of May 1945]. Univerzita Karlova, Praha.

it would be able to protect them against the Nazi ideology. They could not have imagined what would happen to European Jews during WWII. For more information about their lives and mathematical research, see [1, 8].

Some other Jewish, democratically- and leftist-minded mathematicians and physicists were persecuted or imprisoned in concentration camps, ghettos or prisons, managing to survive through five difficult years [for example, Otto Fischer (1909–1975), Paul Georg Funk (1886–1969), Maximilian Pinl, and Kurt Sitte (1910–1993)], while others had to work in special "work camps for the so-called persons of mixed race" [for example, Heinrich Löwig (1904–1995)]. After WWII, all of them continued their professional careers in Czechoslovakia, Austria, Germany, Israel, the USA, Canada, Australiaor South America. Their personal destinies, as well as their achievements, make for fascinating personal stories. For more information, see, for example, [1, 5, 8].

On November 17, 1939, all Czech universities within the territory of the Protectorate of Bohemia and Moravia were closed for a period of three years by a decree issued by the Reichsprotektor Konstantin Hermann Karl, Freiherr von Neurath (1873–1956). However, the top representatives of the German Reich did not actually intend to re-open the Czech universities at all, because they wanted to destroy the Czech intelligentsia. Nine students, representatives of the students' movement, were executed in Ruzyně Prison; almost 1100 students were deported to the concentration camp in Sachsenhausen. In 1940, the Nazis began to significantly reduce the number of Czech secondary schools, setting quotas for their students, graduates and high school graduates. At first, Czech university professors worked at home. Then, by the ministerial decree of July 11, 1940, they were *ex officio* on leave, with a so-called "salary compensation for waiting". They focused mainly on scientific work and writing textbooks. By the end of the war, many of them were totally deployed or involved in war industry and production.[16]

Only German universities could continue their scientific and educational work in mathematics throughout WWII with few obstacles. Mostly at the end of WWII, the most prominent German mathematicians living in Prague and Brno escaped from Czechoslovakia to Germany to avoid the approach of the Red Army [for example, Joseph Fuhrich, Ernst Lammel (1908–1961), Maximilian Pinl, and Alfred Eduard Rössler (1903–?)]. Some of them found new positions in Germanyor Austria, others in South America. They interrupted their contacts with their Czech or German colleagues in Prague. For more information, see [8, 12].

For many reasons, for example, old age or total ignorance of the situation with the war, some German mathematicians were unable to leave Prague.[17] At the beginning of May 1945, they were arrested as proponents of the Nazi regime. Some

[16] For more information about the history of Charles University, see, for example, Havránek, Jan, and Zdeněk Pousta. eds. 1998. *Dějiny Univerzity Karlovy 1918–1990* [History of Charles University 1918–1990]. Volume 4, Univerzita Karlova, Praha.

[17] At the beginning of May 1945, the last graduation ceremony for German university students took place in Prague, while professors asked for an increase in salaries and contributions to the extension of the library, planned the winter semester for 1945/1946, etc. Some German mathematicians gave their lectures in Prague on May 7, 1945.

of them were released and permitted to immigrate to Germany [for example, Friedrich Kraus (1903–1968)], while others unfortunately died in prisons or special camps for German collaborators of the Nazis [for example, Theodor Karl Vahlen (1869–1945) and Gerhard Karl Erich Gentzen (1909–1945)]. For more information, see [8, 12].

From 1945 until 1948, German people were expelled from Czechoslovakia to Germany or Austria according to the decree of Edvard Beneš (1884–1948), the President of Czechoslovakia, who regulated the status of citizens of German or Hungarian nationality, collaborators with the Nazi occupants, and proponents of fascist ideology.[18] Among these were two mathematicians, Gerhard Hermann Waldemar Kowalewski and Paul Georg Funk, two men who ended up walking very different paths.

On May 7, 1945, the Czech police arrested G. Kowalewski, because he was known as a German professor who remained in Prague and taught mathematics at German universities, even during the days of the Prague May uprising, and was considered an active fascist. He was interrogated and held in prison for one year. Like many other German professors, teachers and assistants, he was, in truth, only a passive member of the NSDAP and the Nationalsozialistischer Deutscher Dozentenbund during his stay in Prague, his only true interest being in mathematics. He had never been a member of the Schutzstaffel (SS) or the Sturmabteilung (SA). Following the oral tradition, he obtained expert opinions, positive evaluations, and the support of Russian, Jewish and French mathematicians. Subsequently, Kowalewski was released. Thus, he was able freely to immigrate to Germany with all of his belongings. He went to the American occupation zone, where his wife and two children lived. He obtained a new position in Regensburg, and later in Munich. For more information, see [8].

Being a Jew, Paul Georg Funk was sent to the ghetto in Theresienstadt at the beginning of 1945. His Catholic German wife did not divorce him, thus saving him for the duration of the war from being transported to a concentration camp. He and his two sons survived three difficult months in the ghetto. In June 1945, Funk decided to immigrate to Austria with his family, although they were permitted to stay in Prague as regular Czechoslovak citizens of Jewish-German origin. He quickly saw that, as a German man, he would not be able to continue his teaching and research activities, because he did not know the Czech language, there were no longer any German schools in Czechoslovakia, and German people were not welcome to live there. With great pleasure, Funk accepted an official invitation to Vienna, where he was appointed an ordinary professor of mathematics at the Technical University. For more information, see [8].

Most of the surviving Jewish mathematicians and physicists emigrated from Czechoslovakia during the second half of the 1940s, for many reasons (for example, Heinrich Löwig and Kurt Sitte). They soon recognised that they were

[18]The decree was issued on the basis of international agreements of victorious powers held in Potsdam in 1945. According to the agreements, emigration of citizens of German and Hungarian nationality from the territory of Czechoslovakia started.

unable to find good jobs and become “regular” Czechoslovak citizens, because there were people at the Czech universities [for example, the mathematicians Bohumil Bydžovský (1880–1969), Eduard Čech (1893–1960) and Josef Novák (1905–1999)] who had serious doubts about anyone of German nationality being suitable for Czechoslovak citizenship, and were openly against allowing German teachers to work at Czech schools.

Czechoslovak mathematicians and physicists of Jewish-German origin obtained new positions in Australia, Israel, the USA, Canada or Central America. They continued their research and teaching activities, sometimes with some political or economic problems. Usually, they were in close touch with their Czechoslovak colleagues and friends, because they were bilingual and had Czech-German roots and cultural habits. They were eager to have news from their homeland. For more information, see [1, 5, 8].

We have tried to show that the Czech lands, resp. the Czechoslovak Republic, afforded many possibilities for a good and peaceful life, study, work, research and other activities, and that it is a country that had and still has many talented, motivated and hardworking people, a country that was able to help other people in need. But, unfortunately, it is also a country in the heart of Europe, and thus a territory with a very difficult history and no predictable future.

8 Conclusion

Other large waves of emigration for political reasons that afflicted Czechoslovakia came after 1948, and again after 1968. These, however, are sad stories of their own.

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The Jewish Intellectual Diaspora and the Circulation of Mathematics: Alessandro Terracini in Argentina (1939–1948)

Erika Luciano

Abstract

The racial laws of 1938, which determined, for Italian Jews, the loss of civil and political rights and their complete banishment from scientific and academic arenas, deeply impacted Italian mathematics, which abruptly lost outstanding figures like Levi-Civita, Volterra, Castelnuovo, Enriques, and many others. Their dismissal triggered a series of institutional, epistemic and social changes in culture and scholarship. The Jewish intellectual diaspora is among them. In this paper, after providing an overview of the phenomenon of Jewish mathematical emigration from fascist Italy after 1938, we will focus on the biographical and professional experience of Terracini, who succeeded in reconstructing his life and scientific career in Argentina, where he left a substantial and long-term legacy for an entire generation of young mathematicians (Luis Santalò, Félix Herrera, Mischa Cotlar, …).

Keywords

Fascism · Intellectual diaspora · Italian racial laws · Emigration of Jewish italian mathematicians · Alessandro Terracini

1 Introduction

The racial laws of 1938 ratified the anti-Semitic turn of Fascism and caused the loss of civil and political rights enjoyed by Italian Jews since the Risorgimento period. Between September and December, 478 state employees at the Ministry of National Education were removed from their positions, more than two hundred scholars

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dismissed from universities and the administrative staff fired.[1] Israelite students were thrown out of schools of every order and at every level.[2] Furthermore, the so-called Law of Book Cleaning (*Bonifica libraria*) prohibited the use of texts by Jewish authors in all pre-university institutes and denied them any form of publishing contract whatsoever.[3]

Italian mathematics suddenly lost 33 teachers of mathematics and 14 full university professors and tenured lecturers; figures of excellence such as Vito Volterra, Guido Castelnuovo, and Giulio Vivanti, already retired, were purged from academies, learned societies and other places of mathematical networking (libraries, mathematical and physical seminars, etc.).

This complete upheaval in the ruling academic staff had widespread aftermath in regard to the local research traditions and affected the policies of promotions and displacements in and from other institutions. The desire of the Fascist authorities to show that the Jewish contribution to Italian mathematics had been irrelevant[4] was instrumental in increasing the speed and brutality of the turnover.

Following the dismissals, a series of institutional, epistemic and social changes occurred in culture and scholarship, the dynamics of which can be read from two perspectives: a global one, which views scientific change as a "re-organization of resource ensembles",[5] trying to move beyond the classic discourse of cultural loss and gain, and the individual perspective, that of personal and professional destinies.

The Jewish intellectual diaspora from racist Italy after 1938 is among the global changes originated by racial legislation, and the exile experience of Alessandro Terracini in South America is one example of a happy ending within the context of a dramatic collective phenomenon. As a result of his inability to tolerate professional demotion, social exclusion, economic impoverishment, and complete banishment from scientific and academic arenas, Terracini decided to flee almost immediately, "looking for a space of intellectual survival".[6] For him, the sojourn in Tucumán would be decisive, signifying the beginning of a new stage of scientific activity as a cultural entrepreneur and ambassador of Italian mathematics in Argentina.

2 "Relegated to a Caste of Pariahs": The Autumn of 1938

Letters can change people's lives: for example, those seemingly aseptic ones consisting of a dozen official lines that, in the fall of 1938, were dispensed to facilitate the removal of the Jewish staff from service at Italian universities.

[1]Numerical data are derived from Capristo 2002; Capristo, and Fabre 2018.
[2]Signori 2009.
[3]Fabre 1998.
[4]See L. Berzolari to G. Vacca, Dec. 14, 1938, in Nastasi, and Scimone 1995, pp. 11–12.
[5]Ash 1996, 2008.
[6]Terracini 1989, p. 337: '*uno espacio para sobrevivir íntelectualmente*'.

Signs of the *Provvedimenti per la difesa della razza* – which brutally interrupted a long-term and successful emancipatory path – could actually be traced back some time.[7] The press campaign, followed by the *Manifesto della razza*, and culminating in the racial census in the summer of 1938, were more than enough to predict such a final act.

In announcing the anti-Jewish measures from Trieste (September 3), Mussolini was instrumental in fomenting the 'logical' and 'natural' consequence of the malicious defamatory process that had been developing over the previous months, in which all the traditions of anti-Semitic hatred, both ancient and recent, found complete expression: the anti-Jewish prejudice of Catholic origin, biological racism following the rise of the Italian colonial empire, and the rabid messaging against the Jewish demo-plutocracy and the Judeo-Masonic conspiracy.

Italian high culture in general, and the scientific environment in particular, had not embraced these leitmotifs of classic anti-Jewish propaganda. Some hyper-ideologized institutions, like *Accademia d'Italia* or *Istituto Nazionale di Alta Matematica*, had witnessed sporadic attempts to rewrite the history of science in an Aryan key, together with irregular allusions to the "ancient Eastern and Masonic traditions with which the Israelites, exponents of internationalism, had filled up Italian culture",[8] but this was nothing compared to the phenomenon of *Deutsche Mathematik*. A pragmatic anti-Semitism had flourished, that of the so-called "comrades" (F. Severi, E. Bompiani, L. Fantappié, etc.), who proclaimed themselves alumni and followers of Jewish mathematicians, but strategically intended to take advantage of the purge of their mentors to extend and consolidate their power and prestige in some specific areas: academia, research centers, cultural institutions, publishing houses, etc. The themes of "Jewish infiltrations", of the "absurdly disproportionate number" of Israelites in the ruling class and in the intellectual elite of the country, had thus ended up enjoying significant popularity in the Italian scientific panorama, along with that of instances of favoritism and abuse committed by this lobby. An anonymous report, preserved in G. Fubini's personal dossier, gives a representative cross-section of the convenient anti-Semitic feelings raised in Turin:

> In the University of Turin, School of Mathematics, a few Jewish teachers, Freemason-socialists headed by the all-powerful Prof. Fubini, with a skill and Jesuitism of the worst kind, resort to every measure possible to demolish what the Regime, with titanic efforts, is building. Further, said Faculty is home to tyranny of all types: favoured are the protected ones, the disciples who must one day continue the infamous work, destroyer of the homeland, whilst those who they know they cannot draw into their circle are oppressed, boycotted and damaged in countless ways.[9]

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[7]Israel, and Nastasi 1998; Israel 2010.

[8]Severi 1941, p. 137: '*antiche tradizioni orientali e massoniche di cui gli israeliti, esponenti dell'internazionalismo, avevano riempito la scienza italiana*'.

[9]Archivio Centrale dello Stato Roma, Ministero della Pubblica Istruzione. Fascicoli personali. Professori ordinari (1940–70) 3º versamento. Busta 214, *Personal dossier of Guido Fubini*, 7 Oct. 1933: '*Nella R. Università di Torino, Scuola di Matematica, pochi professori ebrei, social-massoni capeggiati dall'onnipossente prof. Fubini, con un'arte ed un gesuitismo della peggior specie si adoperano con ogni mezzo, per demolire quanto il Regime, con titaniche imprese, sta costruendo. In detta Facoltà si verificano inoltre soprusi di ogni risma: sono favoriti i*

In light of this worldview, it is not strange that traumatic shock was the first reaction to a series of laws with which the State deprived itself of some of its best servants, reducing them to a caste of pariahs:

> so it happened - wrote Terracini to his brother Benvenuto on the same day as Mussolini's Trieste speech - and much more than that all of us expected. There's nothing to do but take the blow, as philosophically as possible, and think about what it will be necessary to do.[10]

Dismay arose for three main reasons: the extent of the discriminatory decrees; the fact that children had also been affected; the silence and indifference of civil society, which the victims of the purge would remember for the rest of their lives. Bewilderment was particularly accentuated in towns like Turin, where, as early as 1938, demonstrations of anti-Semitism had been "but a small thing"[11] and where no one could imagine seeing the walls of central streets covered with proscription lists of Jews, together with murals like "Death to Judas! We don't want the Jews sent to the concentration camps but pinned to the wall with the flamethrowers".[12]

Litotes is perhaps the most appropriate rhetorical device to describe Terracini's problematic interpretation of the racial laws. Terracini, who was not a declared anti-fascist and had remained essentially aloof from the political life of the country, did not view the 1938 measures as political persecution. He did not even qualify as religious persecution. Brought up in a family that was perfectly integrated into society, Terracini was not a practising Jew, and had gradually reduced his contact with the Turin Jewish community,[13] of which he was, however, still officially a part. His own was a sort of secular religion, which blended with the cult of the homeland, with a form of Risorgimento patriotism in the name of which, like many other young Jews (E.E. Levi, A. Viterbi, E. Artom), he had taken part in the Great War.[14] Finally, the laws of 1938 were not viewed by Terracini as a biological-racial persecution. Unlike in Germany, in our country the conception of the genetic and anthropological inferiority of the Jewish race was inconceivable to any man of culture.

Whilst Mussolini declared that Italy would distinguish itself more by its indulgence than by rigor, bureaucracy proceeded immediately and efficiently with the execution of the purge measures. Terracini was relieved of the chair of analytical geometry starting on September 29 and November 11, respectively. On October 21, he was expelled from the National Union of Italian Officers on Leave; on November 10, he was purged from the Academy of Sciences of Turin and the Italian Mathematical Union.

protetti, i discepoli che dovranno un giorno continuare la opera infame, disfattrice della Patria, e sono oppressi, boicottati, danneggiati in ogni modo quelli che essi sanno di non potere attirare nella loro cerchia. Una vecchia Camicia Nera, anonima suo malgrado per evidente necessità'.

[10] A. Terracini to B. Terracini, Sep. 3, 1938, in Terracini 1990, p. 444: '*ecco dunque è avvenuto e assai più di quel che ci si aspettava. Non c'è che da incassare il colpo prendendosela il meno che si può, e pensare a quanto sarà necessario*'.

[11] Terracini 1968, p. 3: '*ben poca cosa*'.

[12] Artom 1940–41, in Treves 1954, pp. 175–176: *'Morte a Giuda! Non vogliamo gli Ebrei in campo di concentramento, ma bensì al muro coi lanciafiamme'*.

[13] Treves 1990, p. 28.

[14] Luciano 2018.

Apart from the mockery of the conversion *in extremis*, he did not hesitate to react, taking into consideration the idea of submitting a request for counter-discrimination. That meant, in essence, to appeal to a provision of the law that exempted Jews of Italian citizenship from the enactment of racial discriminations on the condition that they had acquired exceptional merits, such as being a member of the National Fascist Party from 1919 to 1922 or one of the Fiume legionaries, the soldiers awarded a cross of merit in the four wars that had taken place within the century (Libyan, World War 1, Ethiopian and Spanish), etc. The latter category encompassed both Alessandro and Benvenuto Terracini, who had been decorated with the silver medal of military valor in 1917. However, only very few practices for reverse discrimination were accepted, which is why the attempts of both the Terracini brothers were met with a sharp rebuttal.

When there was no hope left, Alessandro dedicated his energies to tackling the most painful aspect of persecution: the fact that racial laws had robbed the young generations of a future, preventing them from studying. To guarantee an education for his children, Lore and Cesare, who had been driven out of the lyceum, he then began to reflect on the reorganization of the Jewish school in Turin.[15] Israelite schools, hastily set up in several communities, both small and large, constituted one of the proudest reactions of Italian Judaism against the shame of the 1938 *Provvedimenti*. In Turin, a Jewish school did not need to be set up *ex novo*, because, since 1821, the Colonna Finzi College had been providing elementary education for children of both sexes, free of charge in cases of need. Rather, it was necessary to reconsider the structure and the educational offerings of this institute so as, on the one hand, to accommodate the consistent flow of students expelled from state schools at the opening of the academic year 1938–39 and, on the other, to integrate the new members of the teaching staff, which expanded rapidly with the recruitment of scholars fired on racial grounds (for mathematics, B. Colombo, U. Levi, A. Diena, E. Artom and A. Segre). Both Terracini brothers were deeply involved in the task of reorganizing the Jewish school in Turin. Alessandro, in particular, examined the changes to be introduced in order to make it more secular and similar to the standards of national institutions; to this end, the professional and technical classes were flanked by a complete classical curriculum; attention was placed on "the necessity for our schools to be organised with programmes that were in no way inferior to those of the State schools" and "the consequent need to minimize the role of confession"[16]; great effort was made to provide physics, chemistry and science laboratories, suitably equipped with instruments and scientific collections. His efforts played a fundamental role in the modernizing process of the Colonna Finzi College. Although the racial laws required an Aryan ministerial commissioner to carefully supervise all aspects of Israelite schools, up to November 1943, students

[15]Luciano 2017, pp. 196–199.

[16]A. Terracini to B. Terracini, Sep. 4, 1938, in Terracini 1990, pp. 444–446: '*la necessità che il programma non sia in nessuna parte inferiore a quello governativo*'; '*la conseguente necessità di limitare al minimo la parte confessionale*'.

in Turin were able to benefit from a high-level of education, marked by a truly cultural open-mindedness.

Terracini did not confine himself to playing an advisory role, but rather, at the friendly insistence of M. Falco and M. Tedeschi, fully embraced the idea of creating an advanced study plan, aimed at “ensuring a university preparation” for those young people who were prevented from enrolling at the University in the autumn of 1938. In doing so, he used his professional skills as far as the mathematical curriculum was concerned, obtaining the collaboration of many colleagues (G. Fano, G. Ascoli and B. Colombo) and personally collecting several rejected university applicants from Piedmont and Lombardy. However, in the end, he left the project.

3 Getting Ready to Flee: The Last Months in Turin

Terracini spent the winter of 1939 in Turin, in a sort of voluntary isolation, only mitigated by the affectionate presence of P. Buzano, G. Vallauri, E. Persico and F. Tricomi. To save him from the depression into which he was slipping, his friends lent him the books and articles necessary for his research. Tricomi encouraged him to publish the text *Algebra elementare ad uso dei licei* under a false name. The handbook, which would come out in 1940, constituted Terracini’s first foray into the field of mathematics education and represented a unique work in his bibliography. In fact, showing a taste for refined logical-deductive rigor, which one would hardly expect from a geometer belonging to the Italian school of geometry, here he fully developed the modern theory of real numbers according to Dedekind’s construction. The fundamental aim to which every author of school texts aspires – claimed Terracini in the preface – is clarity. Rather, in order to meet the demands for rigor that are compulsory in the introduction of the first elements of infinitesimal analysis, the traditional ancient premises have to be reconsidered. Modern pupils cannot ignore the concept of contiguous classes, which “threaten to reappear at all times”.[17] In order to overcome this obstacle, the most valid alternative is to introduce real numbers by passing through the notion of a couple of Cauchy-convergent sequences of non-decreasing and non-increasing rationals, respectively, which approximate by default and exceed the given number.

Given the attention paid to the foundational aspects, *Algebra* by Tricomi (*alias* Terracini) was a very atypical work, both with respect to the contemporary educational literature and in relation to the output of its virtual author, who would actually confess “the slight discomfort” experienced in seeing his name on the cover of a book inspired by didactic tenets completely different from his own and in which “the treatment of some parts was more developed than in his University lectures”.[18]

[17]Tricomi *alias* Terracini 1940, p. VII: ‘*minacciano di riapparire a ogni momento*’.

[18]Tricomi 1967, p. 66: ‘*la trattazione di alcune cose era più elevata che nelle sue Lezioni per l’Università*’.

Beyond the commitment for the renewal of the Jewish school, and along with some editorial activity,[19] the last months spent by Terracini in Turin were characterized by the search for a position abroad and preparations for his departure. It was at this juncture that his trajectory intertwined with that of the approximately 6000 Jews of Italian citizenship who "packed up and left" between the autumn of 1938 and the end of 1941, and the other 4000 who sought refuge in Switzerland after the armistice and Nazi occupation in 1943, when the discrimination of rights turned into the persecution of lives.[20] Among these, some thirty scholars and six mathematicians can be counted: Gino Fano, Guido Fubini, Beniamino Segre, Alessandro Terracini, Beppo Levi and Bonaparte Colombo. Through the help of Jewish aid organizations and thanks to an international web of solidarity, these outstanding mathematicians succeeded in reconstructing their lives and scientific careers in the US, Latin America, the UK and Switzerland. Against expectations, for many of them the *dispatrio* translated into the beginning of a new stage of their lives as cultural organisers and "sowers of ideas" in lands that were "virgin, but eager to produce".[21]

The Jewish intellectual diaspora after 1938 – in a certain sense, an involuntary exodus determined by a political cause (i.e., racist policy) – greatly differed from typical Italian emigration, considered both from an economic perspective (the exiles were largely representatives of the well-educated and rich middle-class) and in regard to political profiles: those who left the country, in fact, generally did not engage or aspire to participate in political activity,[22] even though some of the persecuted physicists and engineers who fled to the US, like Fano and Fubini's sons Eugenio, Gino and Ugo, would become activists in the anti-fascist movements and collaborate with the military forces in scientific projects during the time of the war.[23]

Officially, the regime encouraged, stimulated and facilitated the Jewish diaspora. In this respect, suffice it to remember that, in February 1940, B. Mussolini informed D. Almansi, the newly elected president of the Union of the Italian Jewish Communities, that Italian Jews must gradually, but absolutely, leave the Peninsula, and

[19]In addition to the high school textbook *Algebra*, Terracini also worked with Gino Fano to prepare the second edition of *Lezioni di Geometria analitica e proiettiva*. This treatise was not primarily addressed to teaching, and, as a consequence, despite its being authored by two Jewish scholars, it escaped withdrawal. It would be published in Turin by Paravia in February of 1940.

[20]While much less studied than emigration on racial grounds from the Third Reich, which was the subject of a seminal work (Siegmund-Schultze 2009), since the late 1980s, the Jewish intellectual diaspora from Fascist Italy has been investigated in relation to particular disciplines, such as physics and medicine (Fermi 1968), with reference to gender (Simili 2010) or with regards to specific destinations: the US and the British Empire primarily (Rider 1984; Camurri 2009; Pontecorboli 2013), but also Switzerland (Broggini 1999) and South America (Korn 1983, later Groppo 2002). Historical studies, however, have mainly focused on the quantitative dimension of such a phenomenon and on some of its distinctive features (Toscano 1988, later Capristo 2014). A recent paper (Luciano 2020) can be considered a first attempt to assess the global aspects of the escape from Italy of Jewish mathematicians.

[21]Santaló 1961, p. XXVII: '*en terreno virgen, pero ávido de producir*'.

[22]Signori 1983; Fanesi 1994.

[23]Fubini, and Brown 2015.

that, between the autumn of 1940 and the summer of 1941, a project for the solution of the “Jewish Question” was carried out, culminating with the idea of creating a Jewish enclave near Lake Tana in the Ethiopian empire.[24]

By contrast, escaping Italy was not easy, and in order to flee the country, three specific conditions needed to be met: suitably solid financial assets, the ability to count on a network of international contacts, and possession of a certain mentality, that is, the capacity to adapt to new contexts and the courage and the strength to reinvent their own lives and careers abroad, typically in distant, random and unknown settlements. Terracini was among the few who possessed these requisites. First of all, he enjoyed adequate means of livelihood, having been paid off with a decent pension after ten years of seniority as a full professor[25]; secondly, he was a cosmopolitan intellectual, who had been abroad several times; lastly, he could rely on the support of top figures in those solidarity chains that had spontaneously been created since 1933 in order to help Jewish intellectuals and scientists to escape from Nazi-Fascist Europe. The international mathematical elite had, in fact, established personal and professional relationships with the members of the Italian school of algebraic geometry since the end of the 19th century. Such links had been preserved over time thanks to the international congresses of mathematicians, and to trips and study sojourns abroad, for example, those spent by V. Snyder and E. B. Stouffer in Turin, by S. Lefschetz and O. Zariski in Rome, and conversely by G. Fano in Aberystwith.[26]

At the top of the Italian migration chains, there were M. Ascoli for the humanities and T. Levi-Civita, the “patriarch of the Italian young Jewish mathematicians eager to be embraced by Uncle Sam”. A contact person for and advisor to the Rockefeller Foundation since 1923,[27] a visiting professor in the Americas several times throughout the Twenties and Thirties, and a spokesman for Italian mathematics around the world, from Russia to Latin America, from the US to Japan, Levi-Civita boasted a web of long-lasting partnerships with the leaders in international mathematics: O. Veblen, G. D. Birkhoff, and Lefschetz in the US, G. Hardy, W. D. Hodge and H. F. Baker in the UK, G. De Rham in Switzerland, J. Rey Pastor in Argentina, and many others. His support was crucial for Terracini, as well as for Fubini, Levi and B. Segre.

Immediately after the promulgation of the racial laws, on his return from a holiday at the Lido of Venice, Terracini visited Levi-Civita in Padua, consulting him on this matter, including possible destinations, and asking him for a testimonial, i.e., the document required to obtain a visa and find accommodation outside Italy. It was Levi–Civita who put Terracini in contact with Veblen, Lefshetz, Birkhoff, Snyder and Stouffer, in an attempt to obtain some *academic opening* for him. Chicago, New York City and Ithaca, NY were all considered as options, as well as the states of Illinois and Indiana. It was at least hoped that he might find a

[24]Ministero dell’interno, Polizia politica, Materia, b. 219, *Ebrei italiani*, fascicolo 1, Turin, Jan. 15, 1939.
[25]ATT: Decree of settlement of retirement pension by Terracini and determination of retiring allowances, Feb. 11, 1939 and Sep. 12, 1939.
[26]Luciano, and Roero 2016.
[27]Siegmund-Schultze 2001.

temporary position at the Institute for Advanced Study in Princeton, where Levi–Civita had already managed to get Fubini hired.

Aware of the impossibility of continuing his work in Italy and wishing to live in a free country, Terracini then launched into what would have been qualified, with painful irony, as a "hunt for jobs" (*la caccia ai giobbi*). Starting in early of October, he wrote to colleagues from all over the world and sent requests to the two main international rescue organizations: *the Society for the Protection of Science and Learning* and *the Emergency Committee in Aid of Displaced Foreign Scholars*.[28]

These two agencies, whose scope was to coordinate and finance the recruitment of scholars and teachers fleeing from Europe, served as vibrant scientific bridges between fascist Italy, the UK and the United States. The *Society*, set up by W. Beveridge, L. Szilard and E. Rutherford, relocated and integrated almost 800 scholars between 1933 and 1940 into the UK and the British colonial Empire.[29] Among those rescued was B. Segre, who was awarded a fellowship in Cambridge and, successively, in London and Manchester. A group of British geometers, on the initiative of J. G. Semple and W. D. Hodge, contributed to a fund and collected £128 to secure a grant for the maintenance of Segre and his family until 1942. On the other hand, the SPSL failed in its attempt to support Terracini, who applied for two vacant chairs at the Universities of Aberdeen and Durham.[30] On the US front, the rescue organism par excellence was the *Emergency Committee in Aid of Displaced German Scholars*, renamed the *Emergency Committee in Aid of Displaced Foreign Scholars* after the Nazi annexation of Czechoslovakia in March 1938. Founded in New York at the Institute of International Education, and coordinated by R. Murrow and S. P. Duggan, between 1933 and 1941, the ECA brought 300 former scientists out of Nazi-Fascist territories.[31] Among the aspiring émigrés who applied were Terracini and Segre, unfortunately both without success.

To benefit from the support of these bodies, a three-step pathway had to be followed: the applicants had to fill in a personal biographical questionnaire; to collect one or more testimonials, which, in the case of Terracini, would be signed by G. Castelnuovo, T. Levi-Civita, G. Fano, W. P. Milne, J. G. Semple and P. Sperry; and to submit a detailed profile of their professional activity, i.e., a *curriculum vitae*, accompanied by a list of publications. Terracini dedicated his entire last winter in Turin to the preparation of these documents, encountering some difficulties at times, for example, when he was asked to answer specific questions concerning his religious identity: Jewish orthodox or reformed?

[28]Regretfully, although we found evidence of these correspondences in the archives of the SPSL and the ECA, as well as in Veblen and Einstein's archives, no traces of answers are conserved in Terracini's family papers. Correspondence relating to the emigration of Fubini, Fano, Segre, Terracini and Colombo will be published by Luciano in 2021. For all subsequent quotations from archival sources and letters, we will refer to this work.

[29]Nossum 2012; Nossum, and Kotulek 2015; Williams 2013.

[30]See Terracini to H. J. Buthchart, 3 Mar. 1939 and attached testimonials by Castelnuovo, Levi-Civita and Fano; Terracini to SPSL, Mar. 16, 1939; SPSL to Terracini, Mar. 16, 1939; Terracini to SPSL, May 9, 1939; Levi-Civita to Buthchart, Feb. 28, 1939.

[31]Duggan, and Drury 1948.

A large number of colleagues mobilized in favor of Terracini. Likewise, in the name of strengthening new institutional focuses on mathematical research, some universities (like those of Lima, Rosario, Tucumán and Rio de Janeiro) took advantage of their historic connections to Italy, and teamed up with the SPSL and ECA to find and bring together Italian Jewish mathematicians.[32] International alumni like Veblen, Zariski, Snyder, E. P. Lane, W. C. Graunstein, T. M. Cherry, A. Reichenberg, and G. and E. Fubini served as links for collaboration, recruitment and mentoring. The engagement of these scholars represents a fundamental lesson in academic rescue and highlights the political role mathematicians can play through scientific diplomacy. Nevertheless, their actions did not always suffice.

A combination of various factors underlies such failures and is particularly informative for us as to the reasons why Terracini's applications were all rejected. In the first place, all the Italian mathematicians who attempted to leave the country were forced to exploit the loopholes of increasingly selective immigration policies. Terracini, Fubini, and Segre, who "played the American card" between 1939 and 1941, were the latecomers, so to speak, and were destined to beg for the crumbs of an international scientific solidarity long since exhausted in favour of refugees from the Third Reich. As Veblen explained to Terracini with strong skepticism, looking for a position in the US or the UK in the autumn of 1938 signified facing ruthless competition, in an intellectual market already bursting at the seams:

> I am making inquiries to find out whether there is any place in this country where there would be an academic opening for you. You will easily understand the difficulties, namely that we have absorbed so many of the scholars who were displaced from Germany that we are dangerously near the saturation point. I am sure that what has already been done has been a great advantage to this country and that we could benefit by further absorption of European scientists. I will do everything I can, but it would not be right for me to hold out any expectation of success. In addition to the saturation effect which I have just mentioned, there is also the fact that recent political events are strengthening the reactionary influences in this country as well as elsewhere.[33]

Secondly, Terracini's life was not in immediate danger, unlike those of German, Czechoslovak and Polish scholars. In this context, it was therefore somewhat natural that the agendas of the SPSL and ECA led to the postponement of his applications in favour of those of A. Duschek, H. Hamburger or A. Zygmund, for whom the prospective of internment in concentration camps was tragically imminent. Furthermore, to Terracini's disadvantage there was the matter of language skills: he declared that he could read and write English with ease, but he did not

[32]See, for example, David Fubini and Laurie Fubini Jacobs' private archive: G. García to G. Fubini, Nov. 4, 1938 and Dec. 16, 1938.
[33]OVP, *AT*: Veblen to Terracini, Oct 4, 1938.

speak it fluently, which constituted a serious "handicap"[34] in view of obtaining a permanent teaching position in any Anglo-Saxon country.[35]

Finally, the outcome of his applications was conditioned by a "matter of style". We do not have enough evidence to argue this thesis, but we can state that, in all the documents provided (*curricula*, reference letters, commented lists of his publications, etc.), Terracini explicitly asserted his membership in the Italian School of Algebraic Geometry and postulated his scientific filiation from the Italian geometric tradition, opened by L. Cremona and driven to a *führende Stellung* by C. Segre:

> I have studied in the University of Turin, having as Professors Fano, Peano, D'Ovidio, Fubini *and above all Corrado Segre* (Higher Geometry).

> The moment I began to undertake my researches on projective differential geometry happened to coincide with the years in which this branch had just left its initial period. Some of the methods were already formed and had been put to the test through the easier problems which always present themselves at the dawn of the theory; the opportunity of contriving other methods was still kept for the future. *Corrado Segre had shown that …*

> Permit me to add that, *according to a tradition which traces its origin back to the middle of the nineteenth century, Geometry has been particularly cultivated both in England and Italy*. […] If it could not be taxed with self-conceit, I should dare think that perhaps ~~a~~ contact from those two geometrical schools should not be quite useless.[36]

We argue that such clear claims of their own cultural roots were probably not appropriate, especially within the American milieu, where Lefschetz – advocate of the topological approach – would support Terracini, but in such mild terms that Veblen had cause to remark:

> I think Lefschetz has been a little too restrained in what he says in favour of the two younger men, Segre and Terracini. In my opinion they are both mathematicians of a very high order.[37]

Faced with these difficulties, and given the fact that the daily situation made his emigration and that of his family extremely urgent, Terracini extended the set of possible destinations, investigating openings in Brazil, Peru and Argentina, which were among the "very few possibilities he still glimpsed".[38] The choices were far from random: on April 4, the *Instituto de Matematica* of the *Facultad Nacional de Filosofia* had been founded at the University of Rio de Janeiro. To fill the various vacant posts, several foreign teachers had been appointed (*contratados*), including G. Mammana and A. Bassi, former assistants of F. Severi, with whom Terracini had

[34]OVP, *BS*: Zariski to Veblen, Nov. 3, 1938.

[35]See, for instance, OVP, *AT* and OVP, *BS*: Zariski to Veblen, Nov. 3, 1938; Segre to ECA, Dec 27, 1938; Segre to SPSL, Jan. 7, 1939; Snyder to L. Farrand, Feb. 9, 1939; Veblen to Coble, May 6, 1939; Coble to Veblen, May 17, 1939; Veblen to Coble, May 22, 1939; Veblen to Segre, Dec. 9, 1939; Segre to Veblen, Coble, Lefschetz, Snyder and Zariski, Jun. 1, 1940.

[36]OVP, *AT*: subject file *Refugees*, Terracini A.; SPSL, *AT*: *Some Indications on my scientific papers*, fols. 369–377; ECA, *AT*: *A short account of my scientific papers*, fols. 1r-8r; SPSL, *AT*: Terracini to SPSL, Dec 11, 1938, fol. 355.

[37]OVP, *AT*: subject file *Refugees*, Terracini A.

[38]Bompiani 1970, p. 6: '*le pochissime possibilità che ancora intravede*'.

been acquainted in Turin in February 1938. Moreover, the *Universidad de San Marcos* in Lima had recruited, in 1936, A. Rosenblatt, a former pupil of Castelnuovo and Fano. Finally, in Argentina, Terracini placed his trust in the indelible mark left by the teaching of Enriques, Severi and Levi–Civita (1927, 1931, 1936), as well as in the esteem of Rey Pastor, the eclectic pioneer of mathematics in Latin America, and the friendship of the "young men": J. Babini, J. Blaquier and F. La Menza, whom he had met at the international congress of mathematicians in Bologna in 1928.

4 "As a Missionary would Explain the Gospel to Cannibals": Research and Teaching

Interviews with Brazil and Peru had seemed to hold promise when a letter from A. Guzmán, dean of the Engineering Faculty of Tucumán, reached Terracini on June 9, 1939, inviting him to occupy the chair of projective and descriptive geometry for the degree program in architecture and that of higher mathematics within the *Profesorado*. The proposal was accepted by Terracini with warm emotion: "I can't believe I will resume the life of teaching!",[39] he wrote to Levi-Civita on the same day that the call came in.

Argentina was one of the most popular destinations for Jewish intellectuals fleeing from Europe: they added to the political exiles of the first wave of migration (the Italian and Spanish anti-fascists arriving in the 1920s and 1930s) and preceded the *después*, i.e., the fascists and Nazis who would take refuge in this country in the post-war period. Among the Italians, several chose this nation to repair the broken thread of their careers, perhaps in part attracted by the greater ease of Castilian compared to English. In turn, Argentina being a young country, numerous newly created universities put in place a targeted recruitment policy towards persecuted scholars and, between 1939 and 1941, authorized the employment of A. Herlitzka, L. Lattes, B. Levi, R. Treves, G. Arias, M. Finzi, R. Mondolfo, the Terracini brothers, and many others.[40]

Historically remarkable by itself, the moment when Terracini joined the ranks of the *Universidad Nacional* represents the beginning of its "golden years". Founded in 1914, this institution included faculties of engineering, pharmacy, law and philosophy. Under the umbrella of the last one, the *Profesorado en Matemática* (i.e., the class designed for the training of teachers) had been established in April 1937. In 1939, the third year was to be implemented, and the existing academic personnel, which comprised just two tenured professors (F. Cernuschi, an engineer

[39]Terracini to Levi-Civita, 9 Jun. 1939, in Nastasi, and Tazzioli 2000, p. 403: '*non mi par vero di poter riprendere la vita dell'insegnamento!*'.

[40]From 1941 onward, visas would no longer be released to the so-called *indeseables*, i.e., individuals belonging to ethnic or religious groups that were not considered integratable into the Argentine 'racial pot' or who did not fit with the essential character that made one Argentinian.

who taught probability, statistics and theoretical physics, and J. Würschmidt, a physicist from Cologne, exiled in his turn for racial reasons, who held the courses in experimental physics), did not suffice. Hence, the invitation to Terracini, a mathematician of genuine distinction, whose arrival would be hailed by students, colleagues and local authorities as the "starting point of a new period in the evolution of mathematical studies in the north-west of Argentina".[41]

After taking leave of their family (Alessandro's brother Benvenuto, niece Eva and grandmother Eugenia would join him in Tucumán in 1940), the Terracinis were expected to flee Italy aboard the Augustus liner on August 24, 1939. However, due to the announcement of the Molotov-Ribbentrop pact, they were able to travel to Argentina only three weeks later, on September 16, 1939, after obligatory stays in Quinto al mare and Sant'Alluccio. After landing in Buenos Aires on October 3, and a twenty-four hour train journey across dusty fields on October 9, they finally reached their new home, at n. 417 of Calle Salta, Tucumán.[42] On October 11, two days after settling, Terracini held his inaugural lecture.

Revealing a remarkable linguistic ability, he quickly managed to positively integrate into his workplace. His desire to affirm himself within the global scientific positioning of Argentina and a determination to show gratitude to the country that had welcomed him, as well as the moral imperative to "do one's duty", all acted as motivational stimuli.

Thrilled with his new surroundings, he resumed publishing and took up research, shrugging off the demotivation that the last months spent in Italy had left him feeling. His production, in quantitative terms, was impressive: thirty papers published in less than ten years, all in Latin American journals, both major and minor: *Revista de la Unión Matemática Argentina*, the proceedings of the Academies of Sciences in Rio and Lima, *Boletín Matemático*, *Revista Electrotécnica*, etc. From the qualitative point of view, undoubtedly, the core of his production was made up of translations and reprints of works that had appeared in Italy before 1938, together with articles spurred by studies conducted before the exile. This is the case, for example, of the essays *El invariante de Mehmke-Segre y los sistemas lineales* and *Sobre la existencia de superficies cuyas lineas principales son dadas*.[43]

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[41]*Evolución de las ciencias en la República Argentina …*,1979, p. 201: '*punto de partida de un nuevo período en la evolución de los estudios matemáticos en el noroeste argentino*'.

[42]Terracini 1968, pp. 123–124.

[43]Terracini 1940a; Terracini 1940b. It is interesting to quote verbatim the excerpts of Terracini's curriculum vitae submitted to the SPSL and ECA pertaining to the sources of his first two Argentinian works (SPSL, *AT*: *Some Indications on my scientific papers*, fols. 375–376, 377): "Tricomi had defined the "density" of a correspondence between points of a space S_3 and planes of another space which is intended to measure, so to speak, how close to each other are planes corresponding to points lying in the neighbourhood of a given point. But he had confined himself to the analytical expression of the density. I have found its geometrical significance, and also a relation with the notion of the total curvature. Moreover, as the metrical notion of curvature leads to the projective invariant of Mehmke-Segre, so two correspondences as before mentioned give rise to a projective invariant. An application to rectilinear congruences"; The interest which has again risen regarding principal lines and our relatively scarce knowledge about them make it opportune to sound their theory more deeply. For instance, as Blaschke points out in his new book

The former constituted a tribute to the expertise of his old austere and beloved mentor, Corrado Segre, at the beginning of Terracini's new scientific life in Argentina. The simple projective characterizations of this invariant had been given by Segre for two plane curves, in 1897, and by P. Buzano for two surfaces in space S_n $(n > 2)$. In two papers dated 1936, Terracini had projected an interpretation of this invariant by virtue of the conception of density of dualistic correspondences.[44] In the 1940 reprint, he provided further applications of the preceding concepts to the theory of the congruence of lines.

The second essay relied on the contents of two notes presented by Terracini in 1937 and 1939, respectively.[45] Submitted for publication in English to the *Annals of Mathematics* in the winter of 1938–39, the article finally appeared in Spanish as a monographic issue of the *Unión Matemática Argentina*. In this paper, chiefly dedicated to the links between the geometry of planar webs and the projective differential geometry of surfaces, Terracini responded to a question asked by W. Blaschke and G. Bol in their *Geometrie der Gewebe* (Berlin: Springer, 1938). Terracini obtained a characterization of Segre's 5-webs as solutions to a certain non-linear differential system. Under additional simplifying hypotheses, he succeeded in integrating the resulting system explicitly.

The particularities of the appropriation of these works by the local audience deserve an in-depth analysis of their own, but they can be credited with the creation of a working group in differential geometry that would be joined by many young Argentine mathematicians, from L. Santalò to F. Herrera and M. Cotlar.

However, Terracini not only returned to some of his previous studies, but also managed to re-target his research activity so as to be in step with the new scientific framework. In 1941, for example, appraising works by E. Kasner and J. De Cicco, he inaugurated a new line of investigation into a particular type of ordinary third-order differential equations and their integral line systems, which he called equations and systems (F) and (G), some of which had arisen in the study of the trajectories of positional forces fields in a plane.[46] According to Togliatti:

> we are here in the realm of the so-called geometry of differential equations. Moreover, not only are the links of these works evident and implicit - on the contrary, I would say that they are in the very nature of the contents - , but so are those among all of Terracini's projective-differential research with the theory of differential equations, both ordinary and partial.[47]

"Geometrie der Gewebe", it is not yet known whether - the differential equation of the principal lines being arbitrarily given a priori - the existence of a surface having those principal lines may be asserted. I have occupied myself with this problem in these last months and arrived at an affirmative conclusion. I also found that - an arbitrary surface being given - it is always possible to map it on several others with preservation of the principal lines".

[44]Terracini 1936a; Terracini 1936b.

[45]Terracini 1937; Terracini 1939.

[46]Terracini 1941a.

[47]Togliatti 1969, p. 402: '*Siamo qui nel campo della cosiddetta geometria delle equazioni differenziali. Sono del resto evidenti ed impliciti, direi anzi che sono nella natura delle cose, i legami non solo di queste ma di tutte le ricerche proiettivo-differenziali di Terracini con la teoria delle equazioni differenziali, sia ordinarie che alle derivate parziali*'.

Terracini combined research with a frenetic teaching commitment: three courses per year, one in didactics within the *Profesorado*, one in analytic geometry at the graduate level and one of advanced mathematics, typically of higher geometry, for the master program. In addition to presenting themes never before addressed in Latin America, such as the theory of groups, complex variable functions, algebraic functions and the calculus of variations, Terracini contributed through his teaching to the diffusion of the vision and didactical assumptions typical of the Italian school of geometry.

In this regard, two of Terracini's courses held in Tucumán between 1939 and 1948 particularly stand out. The first, entitled *Metodología*, was a two-year teaching course on the foundations of mathematics, aimed at students enrolled in the teachers training program.[48] Drafted in Turin in the summer of 1939, and refined on board the Augustus transatlantic that carried him and his family to Buenos Aires, it was a lucid synthesis of the two currents of thought out of Turin that Terracini had had the opportunity to compare: those of Segre and Peano. In the first part, by adopting as a reference the series *Questioni riguardanti le Matematiche Elementari* (Bologna: Zanichelli, 1924–1927) by F. Enriques, the axioms of elementary geometry were dealt with in their technical, historical and methodological aspects. In the presentation Terracini often reported *verbatim*[49] the contents of the famous lectures delivered by Segre at the teachers' training school in Turin, which he had attended in 1910–11. In his university years, however, Terracini had also been trained by Peano in infinitesimal analysis and, although distrustful of the capacity of a strictly formal approach to mathematics, he had appraised the key assumptions of such a procedure. Thus, in the second part of his lectures in methodology, he presented the axioms of arithmetic on the basis of the *Formulaire de mathématiques* edited by the Peanian group (Torino: Bocca, 1894–1908), highlighted the most recent debates on meta-mathematical questions (consistence, independence, categoricity) and even taught Argentinian students to read the Peanian logico-ideographic language.

Likewise, the course of *Matemáticas Superiores* held in 1943 took up the subjects of Terracini's lectures on the theory of groups and topology delivered in Turin in the years 1931–32 and 1935–36.[50] In proposing a first primer of Cremonian transformations, Steiner surfaces and F^3 surfaces, he believed he was offering his audience a fine portrait of the Italian geometric Risorgimento. The lessons on Lie's theory of continuous transformation groups, in turn, led him to celebrate the work of the Norwegian geometer in Argentina, on the occasion of the centenary of his birth, but simultaneously gave him the cue to illustrate the role of Segre and his followers in the diffusion of this address of geometrical studies.

The success of Terracini's tuition was enormous, and all the students who had the chance to attend his lectures "kept as an indelible memory the impression received by the high intellectual level, learning and clarity of exposition of this

[48]BSM, Terracini's archive: notebook N. 19 (*Metodología*).

[49]Terracini's manuscipts on methodology are literal translations into Spanish of several passages from Segre's lectures.

[50]BSM, Terracini's archive: notebooks N. 9 (*Due geometri del secolo XIX Luigi Cremona e Sophus Lie*), N. 14 (*Argomenti vari di geometria (topologia)* and N. 28 (*Matemáticas Superiores*).

great Master".[51] An entire generation of young Argentinian mathematicians got to know algebraic and differential line-geometry, projective differential geometry in hyperspaces, and geometry on an algebraic curve from the synthetical point of view through Terracini's interpretations and narratives. As F. Herrera, one of the five students who took the 1939–40 course in higher mathematics, would remember:

> A wonderful world opened before my mind. […]. I think that none of the students present in that class had the slightest idea of what a group was, in its specific mathematical meaning, but ten minutes of the very clear explanation by Professor Terracini, provided with simple examples taken from Elementary Geometry, Algebra and Mathematics, sufficed so that all of us appropriated the substance of such an important concept without any intellectual stress. Over the years, I consolidated the idea that, in those unforgettable lectures, Prof. Terracini explained to us the foundations of the aforementioned theory, as an experienced missionary would explain the gospel to cannibals.[52]

5 Taking the Voice of Italy Over There: Public Conferences and Publishing

Apart from the divergence of individual trajectories, the Jewish mathematical emigration from fascist Italy was characterised by one striking feature. Rather than being merely a set of individual exile experiences, it was the diaspora of a research school almost in its entirety. Indeed, all the refugees belonged to the Italian school of algebraic geometry, all of them shared a strong cultural relationship with the University of Turin, where they had been students and/or professors, and all of them were interested in promoting the work and style of the team to which they felt they belonged, thus transplanting the best of Turin's mathematical traditions into their host countries.

In Terracini's case, it was not only through his teaching that he passed down the best results of Segre and Peano's research teams. He brought overseas the voice of the "viejo mundo" even more through the organization of public conferences and radio broadcasts and through the creation of a sovra-national mathematical journal.[53]

[51] *Evolución de las ciencias en la República Argentina* ..., 1979, p. 202: '*conservan como un recuerdo imborrable le impresión que les produjo el alto nivel intelectual, la sapiencia y la lucidez de exposición de este gran Maestro*'.

[52] Herrera 2000, p. 106: '*Un mundo maravilloso se abrió ante mi intelecto. […]. Creo che ninguno de los presentes en aquella clase tenía la menor idea de lo que, en su específica connotación matemática, era un grupo, pero bastaron diez minutos de la clarísima exposición, ilustrada con sencillos ejemplos de la Geometría Elemental, del Álgebra y de la Matemática, para que todos captáramos sin mayor esfuerzo mental la sustancia de tan importante concepto. A lo largo los años, afiancé la idea que, en aquella inolvidable clase, el Prof. Terracini nos explicó lo fundamentos de la teoría aludida, como un misionero avezado hubiera explicado el evangelio a los caníbales*'.

[53] For example, in ABTT, the typewritten text of the radio podcast devoted to *Geometría descriptiva y su valor formativo* is preserved, 1942, fols. 1–5.

Among his various initiatives, it will suffice to remember the following few. In September of 1941, Terracini held some meetings on *Origines de algunos conceptos geometricos* in Rosario, Universidad du Litoral, at Levi's invitation.[54] These conversations recapped the main contents of a series of lectures held in Turin in 1934 at the mathematical Seminar of the University and the Polytechnic of Turin, subsequently published in *Periodico di Matematiche* [(4), 15, 1935: 1–21]. Shortly thereafter, he returned the invitation by asking Levi to deliver, in Tucumán, a cycle of seminars on mathematical logic.[55] These talks, informed by Terracini and Levi's previous common background at Turin University, provided some general insights into the studies in the algebra of logic and propositional calculus carried out by the Peanians between the late nineteenth and early twentieth centuries. Beyond their intrinsic value (diminished by some misunderstandings and imprecisions[56]), they largely contributed to the dissemination in Latin America of Italian logic, insofar as they made the basic principles of ideography comprehensible to a public that, in most cases, was neither qualified to understand the demonstrations and methods proposed in *Arithmetices Principia* or in the *Formulario* nor equipped with the wherewithal to source these works. Levi's *Correría en la logica* would be recollected by Terracini as:

> a dive – at that moment and in that place – into the Italian intellectual world. To Tucumán had come Beppo Levi to give those lectures, and at the same time our friend Leone Lattes, professor of Forensic Medicine at the University of Pavia, then living in Buenos Aires, whom I had invited on behalf of the Argentine Scientific Society to speak about blood groups. Also in Tucumán were my brother Benvenuto and another friend of mine, Renato Treves, now a professor at the University of Milan. What we had created in those days was really a little Italy.[57]

Still more influential, in terms of cultural legacy, was Terracini's commitment in the field of publishing. Compelled to leave behind his personal library, which he fortunately found intact upon his return home, Terracini was suddenly aware of the distance from Europe and the difficulty in obtaining books and journals. His decision was immediate: to create a high-quality journal specialized in exact sciences and affiliated with the *Universidad Nacional*: the *Revista de matematicas y fisica teorica*. Less than a year after Terracini had settled in Tucumán, in December 1940, the first issue was published. Together with the *Publicaciones del Instituto de Matematica* and the *Mathematicae Notae*, both edited by Levi, the *Revista* excellently filled a gap in the South American scientific press. To avoid the risk of

[54]Terracini 1941b.
[55]Levi 1942.
[56]For instance, Levi's idea of a proof is out of date; logic and metalogic levels are frequently confused.
[57]Terracini 1963, p. 599: '*vissute come un tuffo - in quel momento e in quel luogo - nel mondo intellettuale italiano. Erano venuti a Tucumán Beppo Levi per tenere quelle conferenze, e contemporaneamente l'amico Leone Lattes, professore di Medicina legale all'Università di Pavia, residente allora a Buenos Aires, che avevo invitato per conto della Società scientifica argentina a parlare dei gruppi sanguigni. Erano anche a Tucumán, come professori, mio fratello Benvenuto e l'altro amico Renato Treves, oggi professore all'Università di Milano. Era veramente una piccola Italia quella che avevamo costituita in quei giorni*'.

making it a journal with only a local circulation, Terracini and the co-director F. Cernuschi spared no effort. Terracini himself nourished the journal with a dozen papers and reviews, obtaining the collaboration of Einstein, Veblen, P. Erdös, R. Courant, L. Godeaux, and É. Cartan, and giving Levi-Civita, Enriques, Fubini, Fano, G. Ascoli, G. Loria and other Italian colleagues silenced by racial laws the opportunity to begin publishing again.[58] His entire family was busy with the progressive typing of manuscripts, translating texts, proofreading, etc. Awards were not long in coming. Papers were submitted to the *Revista*'s editorial board from the four corners of the world and, in turn, in his role as chief editor, Terracini built himself a network of international contacts far larger than the one that he had created before emigration.[59]

6 "Years of Anxious Search for News"

For Terracini, emigration to Latin America, which had begun as a sort of exile mourning the loss of his cultural roots and national identity, turned out to have a truly professional twist. In a very short time, he achieved considerable influence and established himself as one of the 'fathers' of mathematics in Latin America. He who had been expelled from all Italian learned societies was coopted as a member of the *Sociedad Cientifíca Argentina* the day after his arrival in Buenos Aires (October 9, 1939).[60] Shortly thereafter, he joined the *Asociación argentina para el progreso de las ciencias*, which charged him with the task of carrying out a survey on "what should be done for the progress of science in Argentina", with special reference to facilities for mathematical studies.[61]

Appointed a fellow of the American Mathematical Society in April 1942,[62] Terracini did not miss any favorable opportunities to promote wide-ranging cultural projects and expand partnerships with his foreign colleagues in a time when international relationships were boycotted. He attracted talented students, identified potential mathematics incubators and took part in research enterprises, challenges of the moment notwithstanding. For example, by taking advantage of the meetings with G. D. Birkhoff and M. H. Stone, who visited Tucumán in autumn of 1942, he highlighted the difficulties of those scholars who, living far from study centers and

[58]See OVP, *AT*: Terracini to Veblen, Jan. 26, 1943; Veblen to Terracini, Feb. 9, 1943; *AEA, AT*: Terracini to Einstein, Oct. 21, 1941; Archives de l'Académie des Sciences, Paris, Fonds Élie Cartan: Terracini to Cartan, Jan. 6, 1946. Thanks to Fubini, the second volume of *Revista* (1941, p. 5–11) would include a paper by A. Einstein, *Demostración de la no existencia de campos gravitacionales sin singularidades de masa total no nula*. Einstein personally asked Terracini and Fubini to translate his work into Spanish, because he did not want to publish in the language of the Reich.

[59]Striking evidence of this fact derives from the study of the geographical distribution of 9000 offprints constituting Terracini's personal library. Cf. Luciano, and Scalambro 2020.

[60]Terracini would be elected *socio activo* on December 12, 1940.

[61]Terracini 1942b.

[62]Ayres 1942, p. 499.

libraries, had to depend on the help of colleagues and friends. Hence, the proposal (unfortunately aborted due to the war) to establish a central committee for bibliographical information in mathematics and physics under the aegis of the American Mathematical Society.[63]

Despite the important recognition he obtained, the years between 1940 and 1943 were very painful for Terracini, "years of anxious search for news, through radio and newspapers, with their sirens and wall journals, in the persistent longing that Fascism and Nazism would collapse".[64] Pessimism about the war and horror at the massacres of Jews across Europe – information about which, albeit fragmentary, began to filter in – were permanent concerns for all the exiles. So, for example, Terracini was shocked and grieved in the autumn of 1941 upon receiving a postcard from L. Berwald in the ghetto of Lodz, a note in which his colleague and friend told him that:

> he knew he was going to be deported - nor could I say today if he understood the euphemistic use of this verb - and pleaded for a call to Tucumán. Perhaps never as at that moment did I feel the grief of my impotence: I could only report the request to some friends, who unfortunately immediately came to the same conclusion: the impossibility, despite the best intentions, of any attempt to save Berwald. […] And a greater sorrow stemmed from the fact that he felt so disoriented, that in his postcard he added: «I profess evangelical religion».[65]

In summer of 1944, after a prolonged isolation, thanks to American Jewish rescue groups, the Terracinis managed to re-establish communications with their relatives in Italy and, in particular, with Aldo Sacerdote, Alessandro's brother-in-law. The five collective letters they sent him clearly reveal how they were filled with apprehension in their observation of the events of war, their anxiety for the fate of friends deported by the Nazi rogues (*canaglie*), and even a certain kind of remorse for living under such better conditions compared to those who had remained in Italy.[66]

In June 1943, meanwhile, a revolutionary *coup d'etat* led to the president of Argentina, General P. P. Ramírez, being succeeded by E. J. Farrell (February 1944) and J. D. Perón (October 1945-February 1946). Terracini did not suffer any persecution by the Peronists but, fearful of losing his dignity and individual freedom again, he turned to the colleagues who had helped him in 1938. Once more, Veblen,

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[63]Terracini 1942a.

[64]Terracini 1989, p. 349: '*años de ansiosa búsqueda de noticias dadas por la radio y los periódicos, con sus sirenas y sus pizarrones, siempre con el anhelo persistente de que el fascismo y el nazismo se derrumbaran*'.

[65]Terracini 1968, p. 139: '*diceva di aver saputo che stava per essere deportato – né oggi saprei dire se egli si rendeva conto dell'uso eufemistico di questo verbo – e supplicava per avere una chiamata a Tucumán. Mai forse come in quel momento sentii l'angoscia della mia impotenza: non ho potuto che riferirne ad alcuni amici, che purtroppo giunsero subito alla conclusione dell'impossibilità, nonostante le migliori intenzioni, di ogni tentativo per salvare il Berwald.* […] *E una maggiore tristezza derivava dal fatto che egli si sentiva così poco parte in causa, che nella sua cartolina mi aveva aggiunto: «Ich bin evangelischer Religion»*'.

[66]ATCET: Terracinis to Sacerdote, Aug. 6, 1944, Sep. 2, 1944, Oct. 13, 1944, Jan. 27, 1945 and Feb. 1, 1945.

Snyder, Einstein, J. von Neumann, and H. Weyl tried to find him a job, even if only temporary, in the United States, Uruguay or Peru.[67] Despite the support of five institutions (the Institute for Advanced Study, the Guggenheim, Rockefeller and Carnegie foundations, and the Pan American Union), the search was not successful; thankfully, in the meantime liberation day finally came for Italy.

7 The Bittersweet Return to "The Italy of the Stunning Amnesty"

The racial laws were repealed by the allied military government in 1944.[68] With the end of the war, and with the news of the reintegration of academics, reported by the newspaper *Italia Libre*, Terracini found himself faced with "el dilema de la vuelta". It is likely that he had very mixed feelings about this. On the one hand, there was the utmost gratitude towards the country that had hosted him with affection and generosity, "never made him feel a stranger"[69] and gave him the highest honors, including the presidency of the *Union Matemática Argentina* (1945–47).[70] On the other hand, the argument of a potential "affective and ideological recovery" played in favor of returning, since Terracini, like many other refugees, was convinced that "between Italy and Fascism it was possible to distinguish; between Germany and Nazis, not".[71]

Finally, his doubts having dissipated through a series of friendly exchanges of opinion with E. Persico and Castelnuovo, at the beginning of 1946, Terracini started preparations for professional rehabilitation. Apparently unaware of the "betrayal of the clerks" that had occurred in 1938, and without knowing that many had been soiled by the "crime of prostitution of science",[72] he re-established relations with M. Picone, Bompiani, Berzolari and Severi, who included his name in the list of scientists and intellectuals whose presence in Italy was considered particularly urgent for the cultural reconstruction of the country.[73] The Turin Faculty of sciences, in its turn, recommended that the government speed up the return of

[67]See *AEA, AT*: Terracini to Einstein, Aug. 6, 1944; OVP, *AT*: Terracini to Snyder, Aug. 6, 1944; Snyder to Veblen, Aug. 22, 1944; Snyder to Terracini, August 1944; von Neumann to Snyder, Aug. 26, 1944; Snyder to Veblen, Aug. 28, 1944; Snyder to von Neumann, Aug. 30. 1944; Veblen to Snyder, Nov. 7, 1944.

[68]Guerraggio, and Nastasi 2018.

[69]ABTT: typewritten document *La scuola in Argentina*, Turin, Apr. 4, 1948, p. 1: '*non mi ha mai fatto sentire straniero*'.

[70]During his term, Terracini set the by-laws of the Union and convened the *Primeras Jornadas Matemáticas Argentinas*, which greatly contributed to the cultivation of a national spirit within the Argentinian mathematical community. Cf. ABTT: typewritten text of the keynote lecture delivered at the *Primeras Jornadas Matemáticas Argentinas*, July 1945, fols. 1–3 and Santaló 2001.

[71]Terracini 1989, p. 363: '*recuperación afectiva e ideológica*'; '*entre Italia y fascismo era posible distinguir; entre Alemania y nazismo, no*'.

[72]This assertion is taken from Colonnetti 1944, in Colonnetti 1973, pp. 53–54.

[73]ABTT: Terracini to Picone, Jul. 15, 1946.

Terracini, "a teacher of high value, an exemplary citizen, beloved by all", allocating funds to finance his trip.[74]

The moment of repatriation finally arrived in 1948. Preceded by his wife Giulia and their children, Cesare, Lore and Benedetto, Terracini left Argentina in February after finishing the teaching semester, comforted by the feeling "of having carried out his academic responsibilities and duties quite well, and thus having contributed to a good evaluation of the work accomplished by Italians abroad",[75] but, at the same time, bitterly disappointed about "the astonishing amnesty that put back into circulation common delinquents and political criminals, including Jew-raiders and torturers, with the only exception being those whose tortures had been particularly heinous (sic)".[76]

At his departure students and colleagues suffered the feeling of a "great loss".[77] Terracini, however, made certain to maintain connections with his host land. For some ten years, he continued to edit the *Revista* remotely, by suggesting articles, mentoring early career authors, etc. Furthermore, the correspondence with Herrera, Cernuschi and many others clearly reveal the tangible legacy he left with his sojourn in the Argentine Republic.[78] Many of these affectionate protégés, some of whom became colleagues and friends in the course of time, inherited Terracini's ideas and research projects, both in differential projective geometry and in mathematics education. Several of his former alumni would go on to sit on the honor committee for the publication of his selected works and ovesee the Spanish edition of the volume *Ricordi di un matematico. Un sessantennio di vita universitaria*.[79]

8 Final Remarks

Terracini's experience in Argentina must be framed within a tragic collective story of persecution and exodus. Again, litotes is the rhetorical figure that best allows us to characterize it. Terracini's departure was not an escape, because, when he

[74]ASUT, personal dossier of Alessandro Terracini: University of Turin to Terracini, Feb. 1, 1946, and excerpts from the meeting of the full professors of the Faculty of Sciences, Nov. 14, 1945: '*docente di tanto valore, cittadino esemplare, da tutti benvoluto*'.

[75]Terracini 1968, p. 152: '*coscienza di avere compiuto abbastanza bene il suo dovere di professore, e di avere così contribuito a una favorevole valutazione del lavoro compiuto dagli italiani in Sud America*'.

[76]Archivio Museo di Fisica, Roma, Fondo Persico: Persico to Terracini, Aug. 7, 1946: '*la sbalorditiva amnistia che ha rimesso in circolazione delinquenti comuni e politici, tra cui rastrellatori e torturatori, eccetto quelli le cui torture erano state particolarmente efferate*'.

[77]*Evolución de las ciencias en la República Argentina* ... 1979, p. 203: *'experimentaron la penosa impresíon de que algo muy de ellos les era quitado'*.

[78]Cf. for example, in Terracini's papers kept in Turin: F. Herrera to Terracini, Feb. 5, 1948, Mar. 14, 1948, Mar. 18, 1948, Mar. 31, 1948, Aug. 20, 1948, Nov. 2, 1948, Dec. 1, 1948, Apr. 20. 1948; May 18, 1948, Jun. 6, 1948; Jul. 1, 1948, Apr. 20, 1952; F. Cernuschi to Terracini, Jan. 3, 1948, G. García to Terracini, Jan. 15, 1948; R. Mondolfo to Terracini, Apr. 16, 1948; L. Romaña to Terracini, Apr. 19, 1948; J. Würschmidt to Terracini, Oct. 25, 1948, etc.

[79]de D'Angelo, and Herrera 1994.

decided to leave Italy, nobody could have imagined that deprivation of civil and political rights would foreshadow extermination. It was not a *dispatrio*, because he continued to consider himself Italian and never broke the cultural, linguistic, and emotional ties with his motherland, not even in the darkest years of the world war. It was not a political emigration in the strict sense of the term. In fact, Terracini did not flee from Italy because of political commitment or convictions, nor did he participate in the anti-fascist groups that were active in Argentina. His was a choice of life, carefully meditated, shared by his wife and essentially dictated by two factors: the desire to carve out a corner of intellectual survival and the need to ensure a future for his children. An exile, therefore, but a voluntary one.

Emigration could have represented an interruption in Terracini's biography, but instead it facilitated a new start, a turning point in his scientific career, insofar as it entailed the outset of new research lines (didactics, epistemology, high dissemination). If evoking a cultural bilingualism is, perhaps, excessive, it is not like speaking of a "happy encounter between openings, ferments, local fervors and available European energies".[80] Terracini felt he had received a lot from the Argentinian milieu: hospitality, affection, but also cultural stimuli. On the other hand, it was a great fortune for this country to benefit from the scientific, pedagogical and organizational talent of a scholar who highly honored his chair in Tucumán and helped to lead the *Universidad Nacional* in the international arena of mathematical research.

If it is true that every story is a story about people, Terracini's in Argentina is a small-scale experience that deserves to be told, both for its own explicative virtue and because it crosses with macro-history and underlies events and aspects of great relevance. Its historical reconstruction does not endorse *amarcord*. On the contrary, it provides the impact that racial persecutions had on both the Italian and Argentine cultural fabrics and implies identification of the distinctive features of the Jewish mathematical diaspora from Fascist Italy, in many aspects different from that of Nazi Germany. In particular, in analysing Terracini's activity during exile, new elements have emerged that contribute to defining the dynamics of promotion abroad of some exquisitely Italian traditions of thought, such as algebraic geometry and, to a lesser extent, Peanian logic. The network of interactions that arose among national mathematical 'schools', forced into the diaspora for political or racial reasons, turned out to be a factor that was far from negligible in the construction of new architectures of collaboration and in the configuration of new scientific communities in some peripheral areas of South America.[81] As a by-product, a new intriguing chapter in the history of circulation, appropriation and cross-contamination of mathematical knowledge can be written.

[80]Terracini 1989, p. 360: '*encuentro feliz entre aperturas, fermentos, fervores locales y energías europeas disponibles*'.

[81]Of course, I do not mean to imply that mathematical life started in Argentina with the arrival of Terracini. Suffice to mention, in this regard, the name of J. Rey Pastor. Conversely, I suggest that, by studying Terracini's activity in Tucumán, we can see that the spread of Italian mathematics was not limited to Buenos Aires, but also touched 'marginal' towns: Tucumán first, but also Rosario, Santa Fé, and Cordoba, in the northwest of the country.

Abbreviations

ASUT	Archivio Storico dell'Università di Torino
AEA, *AT*	Albert Einstein Archives, Hebrew University of Jerusalem, mss. NN. 11128, 56279, 56280
ATCET	Archivio delle Tradizioni e del Costume Ebraici Benvenuto e Alessandro Terracini, Torino
ABTT	Archivio privato famiglia Benedetto Terracini, Torino
BSM	Biblioteca Speciale di Matematica 'G. Peano', Dipartimento di Matematica, Università di Torino
ECA	Emergency Committee in Aid of Displaced Foreign Scholars
SPSL	Society for the Protection of Science and Learning
OVP, *AT*	Oswald Veblen Papers, 1881–1960, Manuscript Division, Library of Congress, Washington, D. C., Subject File, 1918–1960, *Terracini, Alessandro, 1938–1943*, box 34, 33 Fols. not numbered.
OVP, *BS*	Oswald Veblen Papers, 1881–1960, Manuscript Division, Library of Congress, Washington, D. C., Subject File, 1918–1960, *Segre, Beniamino,* 1938–1941, box 33, 54 Fols. not numbered.
SPSL, *AT*	Archive of the Society for the Protection of Science and Learning, Bodleian Library, University of Oxford, I. Correspondence relating to individual scholars, I.12 Mathematics, *Terracini, Professor Alessandro (1888–)*, File 1938–46, 285/5, fols. 340–87.
ECA, *AT*	Emergency Committee in Aid of Displaced Foreign Scholars records, Manuscripts and Archives Division, The New York Public Library, MssCol 922, Series I, Grant files 1927–1949, I.B. Non Grantees 1927–1945, b. 123 f. 25 *Terracini, Alessandro 1939*

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Physical Chemistry in Greece Before and After World War II as a Case Study for the Effect of Politics on Science and Scientists

George N. Vlahakis

Abstract

This paper presents two parallel stories concerning the community of physical chemistry in Greece just before and after World War II. The first story is about Georgios Karagounis, the founding father of physical chemistry in Greece, who left Greece in 1948. Karagounis had studied in Germany and, before the war, was very active at the University of Athens, where he became Professor at the age of 27. After the war, disappointed by the prevailing situation in Greece, he decided to leave the University of Athens and found a position at the University of Zurich, later becoming professor at the University of Freiburg. The second story is about Georg-Maria Schwab, a renowned professor of physical chemistry in Munich before the war. Because of his Jewish origins, he was forced to leave Germany and flee to Greece to avoid further persecution by the Nazi regime. In Greece, he married Elly Agallidis, the first female physical chemist in Greece, and found work in private industry. Both during and after the war, he came up against several problems because he was German. He was elected professor at the Technical University of Athens, but, in the end, he decided to return to Germany with his family, where he continued his academic career. These stories are just two case studies among many others concerning the political and ideological reasons that forced scientists to leave their countries and migrate to more secure and fruitful environments.

Keywords

Physical Chemistry · University of Athens · Georgios Karagounis · Ligor Bey (Taranakides) · Pandora Nikolaidou · William G. Helis · Elly Agallidis · Georg Maria Schwab · "Nikos Kanellopoulos" laboratory

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1 Introduction

The mainstream history of science, while, in principle, focused on the history of ideas, instruments and experiments, and the formation and deformation of theories, very often ignores the fact that, behind all these achievements and failures, there are real people. People with lives, passions and expectations, people whose personal stories are not only significant per se, but also important as vehicles for explaining the way in which scientific practice has been transformed since antiquity to the present day. In fact, although many have questioned the usefulness of biographies as vehicles for telling a story concerning science, many others have lent their support to this idea (Shortland and Yeo 1996); (Nye 2006); (Greene 2007).

In the present paper, we shall discuss the development of physical chemistry in Greece and the role played by the scientists whose lives and careers were deeply influenced by the political and social status prevailing in Greece before and after World War II.

2 George Karagounis

George Karagounis is considered the first Professor of Physical Chemistry in Greece. He was born at the beginning of the 20th century, in 1905, the "miracle year" of Albert Einstein (Rynasiewicz and Renn 2006). He studied chemistry at the Universities of Goettingen and Freiburg in Germany from 1921 to 1926. From the latter, he obtained his Ph.D. in 1926, on the topic "Über einige asymmetrische Triphenylmethanderivate". After that, he went to Munich, where he worked under the Polish-Jewish professor, Casimir Fajans (1887–1975) (Dunn 1976), in the Laboratory of Physical Chemistry, with the financial support of a grant from the German organization "Notgemeinschaft der Deutschen Wissenschaft".[1] This would imply that, even from this early stage of his career, he was already recognized by leading researchers like Fajans as a young scholar with great potential. It was no accident that this period saw the young Greek publish a number of papers with Fajans in important journals.[2] He remained in this laboratory for about three years,

[1]The Notgemeinschaft der Deutschen Wissenschaft (Emergency Association of German Science), or NG, was founded on October 30, 1920, by the famous German scientists Fritz Haber, Max Planck, and Ernst von Harnack, and its scope was to provide financial support to the scientific research in Germany, which suffered from a lack of funds after the end of World War I.

[2]A list of these papers is as follows:

Über die Beeinflussung der Lichtabsorption des Silberbromids durch adsorbierte Ionen.

K. Fajans, H. Fromherz und G. Karagunis, Z. *Elektrochem*. 33, 548–554 (1927).

Über die Beeinflussung der Lichtabsorption und der photochemischen Empfindlichkeit von Bromsilber-Gelatineemulsionen durch adsorbierte Ionen, H. Fromherz und G. Karagunis *Z. phys. Chem.* B 1, 346–361 (1928).

Über die Beeinflussung der Lichtabsorption von Schwermetallhalogeniden durch adsorbierte Ionen.

K. Fajans und G. Karagunis, *Naturwiss*. 17, 274 (1929).

after which he traveled to the United Kingdom, where he worked as a Ramsay Fellow in the Laboratory of Physical Chemistry at University College, London, under the Irish professor Frederick G. Donnan (1870–1950) (Goodeve 1957). Donnan was a Fellow of the Royal Society and spent almost his entire career at University College, London. During his stay in London, Karagounis was also very productive, and the results of his research were published in a number of papers.

His return to Greece was linked to the history of the Chair of Physical Chemistry at the University of Athens. The Chair was initially established in 1918, and Dimitrios Tsakalotos was elected as its first occupant; he would commit suicide a year later at just thirty years of age. For the next 13 years, the Chair remained vacant, despite efforts to find a suitable person for the position. It is also worth mentioning that, during the academic year 1918–19, practically no lessons were held, due to the pandemic of the "Spanish Influenza".

In fact, there was no election until 1923, the sole candidate for which was the curator of the laboratory, Basil Papakonstantinou, and yet, in the end, no one was elected.

Finally, in 1932, Karagounis was elected Professor *extraordinarius* and, in 1937, Professor *ordinarius* of Physical Chemistry.

Besides the lessons at the University, Karagounis organized a series of lectures that became known as "Colloquia", and many of the best Greek scientists of the '30 s participated. From 1932 to 1938, 100 lectures were given. Of particular interest is the fact that, in 1936, one of the lecturers was Ligor Bey. This person was, indeed, the leading physical chemist in Turkey, Ligor Taranakides, who was of Greek origin, but had changed his surname to Kimyaci. He was Professor at the University of Istanbul and Damascus. He lost his chair after the university reform law of 1933, and, until his retirement in 1942, he served as a teacher of Chemistry at the Girls School of Smyrna (Dolen 2017).

Karagounis succeeded in combining frontline scientific research with the popularization of science. In 1937, he published the first textbook of Physical Chemistry in Greece, based on his university lectures. It is important to note that the book was original, and not just a translation or a compilation of other sources. Since he was also keen to establish a tradition in Physical Chemistry, from 1935 to 1944, he awarded four Ph.D.'s, one of which was granted to a woman, Pandora Nikolaidou. As a sign of the gender bias at that time, we have to mention that Dr. Nikolaidou remained an assistant in the Laboratory for her whole career, while the male Ph.D. graduates obtained much better positions in both academia and the chemical industry.

Beeinflussung der Lichtabsorption von Metallhalogeniden durch adsorbierte Ionen.

K. Fajans und G. Karagunis, Πρακτικά Ακαδημίας Αθηνών (*Proceedings of the Academy of Athens*), 287–301 (1929).

Beeinflussung der Lichtabsorption von Schwermetallhalogeniden durch adsorbierte Ionen, *Z. physik. Chem.* B 5, 385–405 (1929).

Osmotisches Verhalten von starken Elektrolyten in Lösung und Hydratation ihrer Ionen.

K. Fajans and Dr. G. Karagunis, *Z. angew. Chem.* 43, 1046–1048 (1930).

It is also important to note that, in 1936, Karagounis was involved in the first oil drilling project in the Peloponnese, Greece. This project was undertaken by William G. Helis, a Greek immigrant in the United States, who, rising from extreme poverty, managed to become an oil industry tycoon.

The Nazi occupation of Greece and the turmoil of the political period that followed created critical problems for Karagounis and his scientific work. From 1941 to 1944, he struggled to find the necessary sources to survive, and as a his research was not as intensive as in the past.

Of interest, however, is the fact that, in 1948, Karagounis was deeply disappointed with the political situation in Greece; he resigned from his position at the University and decided to look once more for a friendlier environment in scientific research. Consequently, he went to the University of Zurich, where he taught until 1956. During this period, he published several papers in important journals, including *Nature,* one of the most prestigious scientific journals.[3]

From 1956 to 1968, he resided at the University of Freiburg, where he supervised, among other things, four doctoral theses.

In 1959, Karagounis published his important textbook "Einführung in die Elektronentheorie Organischer Verbindungen", which was also translated into English and Polish.

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[3]Separation of polar from non-polar molecules, *Nature* 161, 855 (1948).

Methode zur Trennung polarer von unpolaren Molekeln, *Helv. Chim. Acta* 31, 1929–1936 (1948).

Absorptionsversuche zur Spaltung eines racemischen freien Radikales, *Helv. Chim. Acta* 32, 1840–1846 (1949).

Über das Infrarotspektrum des freien Triphenylmethyl-Radikales, *Helv. Chim. Acta* 34, 994–1002 (1951).

Über eine Beziehung zwischen Verbrennungswärmen und Symmetriegruppen von Kohlenwasserstoffen, *Helv. Chim. Acta* 34, 1999–2005 (1951).

Über eine einfache Methode zur Bestimmung der inneren Oberfläche feinverteilter fester Substanzen,

Helv. Chim. Acta 36, 282–290 (1953).

Zur Bestimmung der spezifischen Oberfläche fein verteilter fester Stoffe, *Helv. Chim. Acta* 36, 1681–1687 (1953).

Über eine Schmelzpunktserniedrigung organischer Substanzen in dünnen Schichten, *Helv. Chim. Acta* 37, 805–814 (1954).

Über das Infrarotspektrum molekularer Schichten auf Trägermaterial, Georg Karagounis und Ottokar Peter, Z. Elektrochem. Ber. *Bunsenges. physik. Chem*. 61, 827–833 (1957).

Über das infrarote Spektrum organischer Substanzen in dünner Schicht, Georg Karagounis und Ottokar Peter Z. Elektrochem. Ber. *Bunsenges. physik. Chem*. 61, 1094–1100 (1957).

Zur Wirkungsweise von Korrosionsinhibitoren, Georg Karagounis und Hermann Reis.

Z. Elektrochem. Ber. *Bunsenges. physik. Chem*. 62, 865–870 (1958).

Über das Infrarotspektrum organischer Verbindungen gesoreitet in dünnen Schichten auf Oberflächen von Ionengittern. 3. Mitteilung, G. Karagounis und O. Peter, Z. Elektrochem. Ber. *Bunsenges. physik. Chem.* 63, 1120–1133 (1959).

Gaschromatographische Spaltung racemischer Verbindungen, G. Karagounis and G. Lippold, *Naturwissenschaften* 46, 145 (1959).

Karagounis returned to Greece in 1968, when the government was under the military Junta. It is curious that someone who left Greece because he felt like an outsider would decide to come back during this undemocratic period. There is no written evidence to explain his decision, but it may have had to do with his religious beliefs. The military junta had, as its motto, the famous phrase "Greece, the land of Christian Hellenes", and the deep Christian faith of the Greeks had been exploited for the purposes of their anti-communist and anti-leftist agenda. Karagounis was a devout Christian, so perhaps he thought that he could return and work for the good of the development of scientific research in Greece.

He therefore accepted an eight-year contract to organize the Center of Physical Chemistry at the National Hellenic Research Center in Athens.

He worked hard to this end, and more than fifteen papers in international journals and four Ph.D.s later, the mission could be considered accomplished.

It is also interesting that Karagounis remained in his position after the re-establishment of democracy in Greece in 1974.

Finally, he retired, continuing to work in his small private laboratory in Kifissia, one of the most beautiful suburbs of Athens, and he took this opportunity to turn his interests to more philosophical subjects. In 1984, he became a member of the Athens Academy; he was also elected as a member of the *Accademia Mediterranea delle Scienze* and the *Accademia Tiberina* in Rome, in 1982 and 1986, respectively.

George Karagounis' life was undoubtedly interesting, but no less so is the parallel story of Georg Maria Schwab and his wife, Elly Agallidis.

3 Elly Agallidis and Georg Maria Schwab

The name 'Elly Agallidis' first appeared publicly as the only female lecturer in the colloquia organized by Karagounis in the 1930s. At one of them, she delivered a paper that was later published in the *Zeitschrift für Physikalische Chemie*.

Elly Agallidis was born on August 25, 1914, in Athens (Photo 1). She came from an upper middle-class family, and her father was a well-known architect who had studied in Munich. The family archives reveal that, from an early age, Agallidis was an independent character whose attitudes were not compatible with what was, at that time, usually considered an acceptable comportment for a young lady.

After receiving a basic education at home, she attended high school at the German School of Athens. These are likely the years in which her great interest in physics developed. On completing her secondary education, she entered the Physics Department of the University of Athens. After graduating, her family suggested that she should follow postgraduate studies in a field related to chemistry. This proposal was not random, as the family was on very friendly terms with Nikos Kanellopoulos, himself a chemist and owner of one of the most important factories in Greece, a fertilizer company in Elefsina, a town near Athens. This meant that Agallidis could easily find a well-paid job there if she had the relevant qualifications.

Photo 1 Elly Agallidis in her lab

For this reason, Agallidis began pursuing her Ph.D. research in physical chemistry with George Karagounis. Karagounis proposed that, as a key step towards finishing her thesis, she should attend some courses at a German University, and, as he already had good contacts with the University of Munich, Agallidis went there. This was her first encounter with Georg Maria Schwab, her tutor at the university. She stayed in Munich for a couple of years, and then returned to Athens, where she finally received the title of Doctor in Philosophy from the University of Athens in 1940.

Meanwhile, in Germany, Hitler and the Nazis had come into power. This was a difficult period for many scientists, both the lesser known and the more well known, including, from the latter group, Georg Maria Schwab. In addition to his liberal ideas, he was also half-Jewish, which meant that his situation was, to say the least, precarious. It is of interest that Schwab learned of his Jewish origin only when he was obliged to register himself at the University of Munich at the beginning of his career there in 1933, the year the Nazis started to govern Germany.

From an early age, it seemed that Schwab's destiny was to be looked upon everywhere as a foreigner, as we may gather from a short biographical note written in his memorial:

> Although born in Berlin in 1899, he had Bavarian citizenship, which, in Prussia at that time, was equivalent to being a foreigner. The reasons for this peculiarity were his parents' origins in Bavaria; his father had been displaced to Berlin, where he was managing editor of an important newspaper.

In the summer of 1938, Schwab visited Greece and was hosted by Agallidis's family. The situation in Germany was already posing difficulties for him.

In March 1939, Professor Schwab left Germany and drove southwards. Agallidis's family introduced him to Nikos Kanellopoulos, and Schwab started working in the research laboratory of the factory, with Agallidis as his co-worker. Finally, in October 1939, they married (Photo 2).

In April 1941, when the war between Greece and Germany started, Schwab was arrested by the Greek Secret Service and detained in a concentration camp.

Photo 2 The happy newly married couple. Georg Maria Schwab and Elly Agallidis

When the Germans captured Athens, they liberated him, but they always considered him a potential danger.

After the war ended and certain issues with British power in Greece had been resolved, Schwab finally took up a professorship at the prestigious National Technical University of Athens. Reports from that era show that Schwab was an excellent teacher and eminent researcher. Thanks to Schwab, physical chemistry at the National Technical University of Athens became a very important subject, and the quality of the research there reached an international level of prestige.

In the early sixties, Schwab left Greece, reclaiming his former position at the University of Munich, although he promised to return for a couple of months every year to give a number of special lectures. Schwab kept his promise. For Agallidis, however, this was the end of her scientific career. As she later wrote, she had accepted the role of the dedicated wife of a great scientist, organizing meetings, lunches and dinners in their home. They had three children, who could not help but be proud of their parents.

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