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National Subcommissions of ICMI and their Role in the Reform of Mathematics Education

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Introduction

This book focuses on the national subcommissions of the International Commission on Mathematical Instruction (we use the contemporary name of the commission and the contemporary abbreviation of that name, ICMI, although during the time with which this book deals, the German or French name and abbreviation were usually used, and even the commission's English name was somewhat different, the International Commission on the Teaching of Mathematics). Probably, the first to propose the idea of writing such a book – at a conference on the history of mathematics education in Turin in 2015, during which a report on the Russian subcommission (Karp 2017) was presented – was the then president of ICMI, Ferdinando Azzarello.

Indeed, by that time, studies devoted to specific subcommissions already existed (such as Giacardi's (2009) paper on the Italian subcommission), but in many countries, their work was virtually unresearched, and moreover, what had been done was scattered among various publications devoted to other subjects, not gathered together.

Meanwhile, the whole importance of ICMI's work becomes clear only when we see that the movement initiated by David Eugene Smith and headed by Felix Klein involved not just the dozens of scientists and teachers who gathered together at international congresses and conferences – all of them undoubtedly highly gifted and deeply interested in the development of mathematics education – but in fact hundreds and probably sometimes even thousands of people in different countries who in various ways, if only in the passive role of observers, participated in the work of the national subcommissions.

The main task of the International Commission formed in 1908 consisted in preparing national reports, which was the purpose for which the national delegations (subcommissions) were formed. Naturally, it was expected that the mutually enriching exchange of information would lead to further improvements in education. This book focuses on a relatively short period. In 1914, when the First World War began, international meetings ceased, although the subcommissions could continue working on their reports. By 1920, the publication of these studies had been completed, in one way or another, and the International Commission itself was dissolved.

This is the period – from 1908 to 1920 at the latest – that this book chiefly focuses on. A little space is usually given in its chapters to subsequent years as well, when ICMI was revived and, under the presidency of Smith, and later of Hadamard, attempted to continue its prewar activities, until this attempt, too, was cut short by the Second World War. Admittedly, some of the contributors to the present volume remark on the derivative character of ICMI's work under Smith and Hadamard – there were no new ideas. More precisely, the postwar shock had not been overcome, and the changes that had occurred had not been fully acknowledged.

In this connection, one must appreciate the fact that people working at the beginning of the twentieth century were in a certain sense far more optimistic than subsequent generations. After living through world wars and decades of continuing conflict, which on numerous occasions could have brought about the destruction of civilization, we instinctively are far more skeptical about the possibilities of collaborative work among different countries for the welfare of humanity as a whole. That was not the case in the late nineteenth and early twentieth centuries. Naturally, this time can by no means be considered a golden age – colonial empires flourished, racial and social inequality remained as strong as it had ever been in some places, and in some, it became even stronger. But very many people had a sense of technological progress and along with it – as they wanted to believe – of social progress. It is no accident that in several chapters in this book, the development of mathematics education is examined in connection with the broader struggle for the democratization of society.

The world was developing. Communication was improving. The need for technically educated individuals was growing – and hence also the need to expand and improve the teaching of mathematics. The desire to focus on it and improve it collaboratively was in the spirit of the times – one might marvel at Klein's and Smith's tirelessness, but the actual direction of their work was at the time not so surprising. These were decades of associations and unions, and representatives from different regions and countries wanted to collaborate.

Naturally, the millions – to paraphrase Schiller's "Ode to Joy" – did not always seek to embrace one another, and in the work of the commission, rivalry can be clearly detected, including occasional joy about the fact that "we" (our country) are ahead of the others. But Lenin's frequently quoted words about the start of the World War – "two bandits launched an attack before three bandits had time to obtain the new knives they had ordered" – express a view of the world that became widespread only later and led, already after the end of the war, in 1920, to the dissolution of ICMI and to the collapse of international collaboration in the field of mathematics instruction. Before the war, people were thinking not just about knives, and they did not assume that there were only bandits around them. Working on the history of the short period to which this book is devoted, it is impossible to shed the sense of the tragedy of what happened in the world, and in mathematics education.

But in 1908, all this was still in the future. The call had gone out, and it had found a response. We should say at once that the present book by no means aspires to be an exhaustive treatment of the subject, if only because it contains chapters only about a relatively small share of the countries taking part in the movement (although these countries were indeed very important). One would like to hope that, in time, this book will have a continuation devoted to other countries. But even in terms of the countries that are covered in this book, one can hardly hope to exhaust all aspects of the work of each of their respective subcommissions in a single chapter.

Participation in the work of the International Commission took place within the context of attempts to reform mathematics education in each of the countries, and this prehistory of the national subcommissions, as it were, deserves study. Each country's delegation (i.e., each country's official representatives in the International Commission) relied on the work of a kind of active core group (which was very small in some cases and relatively large in others), and the lives and work of all of these people are of interest. The ongoing life of each subcommission itself – its organization, arguments, agreements, financing – tells us a great deal both about the history of its country, in general, and about the history of that country's mathematics education. The reports of the subcommissions and contemporary publications concerning their work have previously not been sufficiently analyzed, but they tell us both about the state of education in each country and about the viewpoints and aspirations of their authors. Finally, mention must also be made of the movements that sprung up in participating countries in response to the work of the subcommissions.

The chapters published in this book differ in approaches and in their authors' main interests. By no means, all of the topics alluded to above are treated in them in equal detail, nor were the roles of the subcommissions everywhere identical – it is clear, for example, that in Germany, with its developed reform movement and large number of various professional associations and, so to speak, platforms for discussion, the subcommission's role was somewhat different from what it was, say, in Russia, where its work in many respects stimulated the formation of such platforms. All of the questions raised in this book can and should be investigated further – as, for example, a discussion of the financial aspects of the subcommissions' work can shed light on the mechanisms through which social institutions operated in different countries (or even in countries with different degrees of centralization, whose governments consequently played different roles).

The International Commission did not carry out its work to the end, since the juxtaposition, comparison, and generalization of the accumulated materials were not carried through to substantive results, although attempts to do so were undertaken, at least in Germany and the United States. The generalization of the materials of the national commissions remains of interest to this day, over a hundred years after they were collected, but it too remains largely outside the scope of the present book.

And yet, the chapters of this book, which in many cases rely on previously unpublished and unanalyzed materials, offer a great deal of information for those who are interested in history and in the history of mathematics education and indeed in mathematics education in general. We are presented with an experience of collaboration between research mathematicians (including very prominent ones) and teachers that is today probably inconceivable on such a scale, in the course of which questions were posed and discussed that would be resolved in various ways in the course of the century that followed, and probably to this day have not all been resolved. Today's research in mathematics education cannot fail to take this experience into account, especially because it reflects the specific characters of very different countries, which subsequently – even if not necessarily following the path that the leaders of their national subcommissions envisioned – continued to play important roles in the world system of education. One cannot embark on new research without knowing about research that has been done in the same field earlier, and this book tells about what was perhaps the most important stage of this research.

The book's structure is simple. The chapter by Fulvia Furinghetti, which opens the volume, discusses the work of ICMI as a whole during the years under examination, providing a kind of general background against which the national subcommissions operated. This is followed by chapters devoted to specific countries and their subcommissions. The countries are dealt with in alphabetical order, chapter by chapter: France by Renaud d'Enfert and Caroline Ehrhardt, Germany by Gert Schubring, Great Britain by Leo Rogers, Italy by Livia Giacardi, and Russia and the United States by Alexander Karp.

In conclusion, I would like to express my gratitude to all those who took part in reviewing the materials for this book.

References

Giacardi, Livia. 2009. The Italian contribution to the International Commission on Mathematical Instruction from its founding to the 1950s. In *Dig where you stand. Proceedings of the Conference on On-going Research in the History of Mathematics Education (Garðabær, Iceland, June 21–23, 2009)*, eds. K. Bjarnadóttir, F. Furinghetti and G. Schubring, 47–64. Reykjavik: University of Iceland.

Karp, Alexander. 2017. On the Russian national subcommission of the ICMI. In "*Dig where you stand" 4*, ed. by Kristín Bjarnadóttir, Fulvia Furinghetti, Marta Menghini, Johan Prytz, Gert Schubring, 149–166. Rome: Edizioni Nuova Cultura.

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Chapter 1
Challenges, Hopes, Actions, and Tensions in the Early Years of the International Commission on the Teaching of Mathematics

Fulvia Furinghetti

Abstract The International Commission on the Teaching of Mathematics can be considered the parent of the International Commission on Mathematical Instruction (ICMI). This chapter describes the activities and major ideas of this Commission from its foundation in 1908 through the First World War. A brief account of the events in the community of mathematicians that formed the background of this foundation is presented as well. The chapter also outlines the steps that first brought the dissolution of the Commission and, later, its reconstitution in 1928 during the International Congress of Mathematicians in Bologna.

Keywords Mathematical instruction · Internationalization · Reforms · International Commission on the Teaching of Mathematics

1 Introduction

In 1908, during the fourth International Congress of Mathematicians the "International Commission on the Teaching of Mathematics" was founded. After changes in status, aims, and contexts as well as periods of lethargy, this Commission became the present ICMI (International Commission on Mathematical Instruction).[1] This chapter focuses on the early years of the Commission which contain the germs of future developments.

[1] See the website Furinghetti and Giacardi (2008) for information and documents on the first hundred years of ICMI and its ancestors. Information about the characters mentioned in this chapter who had been members of the Commission can be found in the "Portrait gallery" of this website.

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Before the Second World War, the most used name for the Commission was French (*Commission Internationale de l'Enseignement Mathématique* and the related acronym CIEM).[2] Also the German designation (*Internationale Mathematische Unterrichtskommission* and the related acronym IMUK) was used, especially under Felix Klein's presidency. In English there were slightly different designations and no acronyms; David Eugene Smith usually employed the expression "International Commission on the Teaching of Mathematics." In Italian, acronyms were not used for the *Commissione Internazionale per l'insegnamento Matematico*. When the International Mathematics Union reconstituted the Commission (March 6–8, 1952), the name "International Mathematical Instruction Commission" (IMIC) was adopted (Behnke 1951–1954, p. 81), though in some documents (including the report of Behnke himself) also, the old appellations are present. The name IMIC was ephemeral: in the closing speech of the 12th International Congress of Mathematicians held in 1954, Jan Arnoldus Schouten thanked the organizations that supported the congress, among them "the C.I.E.M., I.C.M.I., or I.M.U.K." (Gerretsen and de Groot 1957, p. 156). When the English language became the international language in the mathematics community, the International Commission on Mathematical Instruction (ICMI) became the name most frequently used.

2 The Internationalization of the Community of Mathematicians and the Establishment of the International Congresses of Mathematicians

For many decades the lives of the International Commission on the Teaching of Mathematics and its successor, the International Commission on Mathematical Instruction (ICMI), have been intertwined with the life of the community of mathematicians; the very roots of the ideas animating their creation are present in some events of this community. As a matter of fact, the key issues of internationalization and cooperation emerged clearly in the second half of the nineteenth century in the milieu of mathematical research and then were transferred to the milieu of mathematical instruction. For this reason the overview of the early years of the Commission presented in this chapter takes as a start point some key events in the life of the community of mathematicians.

On the occasion of the World's Columbian Exposition held in Chicago (1893) in celebration of the four-hundredth anniversary of Christopher Columbus's discovery of the "New World," beside the usual activities the organizers planned to have thematic congresses aimed at representing the most relevant cultural aspects of the

[2] For many decades English, French, German, and Italian were the official languages of the International Congresses of Mathematicians and of the Commission.

period. One of these events, held from August 21 to 26, 1893, in the week designated for Congresses on Science and Philosophy, was the Congress on Mathematics and Astronomy (Parshall Hunger and Rowe 1993; Tayler 1893). On the first day, the Congress split in two sections (Astronomy and Mathematics). The section devoted to mathematics was organized by the mathematicians Eliakim Hastings Moore, Oskar Bolza, Heinrich Maschke, and Henry S. White. The attendants numbered 45, 41 from the USA and 4 from abroad (2 German, 1 Austrian, 1 Italian). The authors of papers numbered 39: 13 from the USA, 16 from Germany, 3 from France, 3 from Italy, 2 from Austria, 1 from Russia, and 1 from Switzerland (Moore et al. 1896, pp. i-xvi). Some authors did not attend the meeting, and their papers were read in absentia. This meeting, considered the first international congress of mathematicians,[3] is a landmark in the history of the community of mathematicians because it marks an important change in the way research was done. In his opening address at the Chicago congress, Klein (1896, p. 135) claimed that "A distinction between the present and the earlier period lies evidently in this: that what was formerly begun by a single master-mind, we now must seek to accomplish by united efforts and cooperation." He acknowledged that in France, under the influence of Henri Poincaré, mathematicians were starting to work according to this model and that the mathematical societies created in Germany and in New York[4] had similar purposes, but his final claim was that "our mathematicians must go further still. They must form international unions, and I trust that this present World's Congress at Chicago will be a step in that direction" (Klein 1896, p. 135). We know that the project of having an international union of mathematicians was realized later (1920), but the Chicago Congress and Klein's address represent a milestone in the path toward cooperation and internationalization in the mathematical community. A first step in this direction was the establishing of a quadrennial International Congress of Mathematicians. As reported in (Lehto 1998, pp. 3–11), the initial idea of this kind of event was proposed by Cantor, but a fundamental contribution to the realization of the project was provided by the journal *L'Intermédiaire des Mathématiciens*, edited by the two French mathematicians Charles-Ange Laisant[5] and Émile Lemoine.[6] In the preface of the debut issue of their journal, the editors developed reflections on the new forms of interaction in mathematical research similar to those Klein had presented in Chicago (Les directeurs 1894). Following this line of thought, they launched an inquiry among the readers of the journal on the advisability of an international meeting of mathematicians held at a regular interval of time in different countries

[3] This is the way the meeting is mentioned in the official website of the International Mathematical Union (IMU).

[4] The *Deutsche Mathematiker-Vereinigung* was founded in 1890, the *New York Mathematical Society* (becoming the *American Mathematical Society* in 1894) in 1888.

[5] Auvinet (2013) reported from Brigaglia (1984, p. 46) that since 1891, Laisant had already been the author of a "projet d'association universelle internationale des mathématiciens" (project of an international universal association of the mathematicians).

[6] Lemoine was the author of a paper read at the Chicago Congress.

(Laisant and Lemoine 1894, p. 113, question 212). The indications for future congresses of mathematicians put forward by the editors were largely followed at the first International Congress of Mathematicians in Zurich (1897).

3 The Internationalization of Mathematical Instruction

3.1 The Foundation of the International Commission on the Teaching of Mathematics (Also Known as CIEM/IMUK)

The context outlined above fostered similar aspirations to communication and internationalization associated with solidarity in the world of mathematical instruction. Evidence of this fact was the founding of the journal *L'Enseignement Mathématique* [Mathematics teaching] in 1899 by two mathematicians, Laisant and the Swiss Henri Fehr (Furinghetti 2003). In the presentation of this journal, the editors claimed explicitly that they wanted to join the great movement of international solidarity present among mathematicians that was so well exemplified by the Zurich congress of 1897. The mathematics teaching dealt with in the journal concerned mainly the Secondary and Tertiary levels as well as teacher education. The expression "mathematics teaching" has to be contextualized for the period in question. Most authors were mathematicians, not teachers or teacher trainers. Therefore, as Howson (2001, p. 182) put it "[the contributions were] likely to reflect not what was actually happening in schools but what some influential mathematicians thought might with advantage happen in them."

In the second half of the nineteenth century, journals devoted to mathematics teaching were created in some countries, but *L'Enseignement Mathématique* was unique for its aim of internationalization. In my previous studies of this journal, I have stressed how difficult it was to realize this aim (Furinghetti 2003; Furinghetti 2009). In the journal French was the most used language, and the contributors were mainly European. Nevertheless the Editorial Board (in the journal called *Comité de Patronage*, literally "Supporting Committee"), which existed until 1914, included mathematicians from Ann Arbor (Michigan),[7] Athens, Cambridge, Copenhagen, Geneva, Genoa, Gent, Gottingen, Groningen, Heidelberg, Kazan, Kiev, Moscow, New York, Paris, Porto, Rome, Stockholm, Vienna, Warsaw, Woolwich (England), Zaragoza, and Zurich. The journal had regular columns announcing events, publications of books and journals, correspondence, as well as news from the community of mathematicians, associations and universities. The journal was global in its scope. Another practice linked to internationalization

[7] The representative from Ann Arbor was Alexander Ziwet, who participated in Chicago Conference of 1893 and reported on Klein's *Lectures on mathematics: delivered from Aug. 28 to Sept. 9, 1893* (New York: Macmillan, 1894).

was the publishing of articles on the teaching of mathematics in different countries. This initiative highlighted the usefulness of having this kind of information in order to improve mathematics teaching.

A further step toward the internationalization of mathematics teaching was provided by the inclusion of a section (usually the last) dedicated to this subject in the program of International Congresses of Mathematicians from the second meeting (1900) onward. The conception of what could be of interest in the mathematics teaching section was linked to the times and to the fact that the section was in the context of an event handled by the mathematical community. In this concern Smith wrote

> I admit that I was disappointed by the nature of the works presented in the section on teaching at the Congress at Heidelberg. It did not seem to me that the subjects were considered in their true pedagogical sense. It was more often a question of certain mathematical details, and not an accurate study of the general problems of mathematical education. (La Rédaction 1905, p. 471[8])[9]

Nevertheless the demands about mathematics teaching in higher education put forward at Heidelberg congress in 1904 directed attention to the problem of reforming mathematics teaching in university. *L'Enseignement Mathématique* reported on these demands and asked mathematicians interested in the problems of mathematics teaching for opinions about possible reforms (La Rédaction 1905). In the same volume, the journal published the reactions by Gino Loria, Émile Borel, Jules Andrade, David Eugene Smith, and Francisque Marotte. They discussed basic themes such as the teaching of geometry, the introduction of functions, the development of topics to be taught according to students' intellectual development, the relationship of mathematics to the other disciplines, and the issue of teacher training. Loria and Smith took into consideration the history of mathematics. In his note, Smith (La Rédaction 1905, pp. 469–471) wrote that the best way to reinforce the teaching of pure mathematics would be the establishment of a commission appointed by an international congress which would study the problem in its entirety. With this initiative Smith introduced a political dimension: on the one hand, he acknowledged the fact that the mathematical community was the milieu where the discussion of mathematics teaching was developing, and on the other hand, he hinted at the need for an approach to the problems of mathematics teaching which would be carried out by specialized scholars. This dichotomy was solved in the late 1960s, thanks to the autonomy reached by the community of mathematics educators (Furinghetti 2008).

In the following issues, *L'Enseignement Mathématique* did not publish further opinions, but the seed sown by Smith's proposal sprouted in the fourth International Congress of Mathematicians held in Rome (April 6–11, 1908). The articles of

[8] All translations in this paper are by the author.

[9] *J'avoue que j'ai été déçu par la nature des travaux présentés à la Section d'Enseignement au Congrès de Heidelberg. Il ne m'a pas semblé que les sujets traités étaient envisagés dans leur véritable sens pédagogique. Il s'agissait le plus souvent de certains détails mathématiques, et non pas d'études approfondies des problèmes généraux de l'éducation mathématique*. (La Rédaction 1905, p. 471)

Donoghue (2008) and Schubring (2008)[10] provide a behind-the-scenes glimpse of early efforts to establish the International Commission on the Teaching of Mathematics and to organize its work. These articles show the broad role of Smith in all of the steps of the process of its founding. As discussed by Schubring (2008), this was not a straightforward success story since the initiative for creating such a Commission had nearly failed in Rome. On April 9, 1908, Smith presented his paper and proposed establishing an international committee at the session of the Fourth Section devoted to philosophical, historical, and didactic questions, which was presided over by the German astronomer Friedrich Archenhold. Archenhold put the proposal to a vote, and the Fourth Section approved it. Smith then asked for a confirmation of the proposal in the next session of the Fourth Section. The German Max Simon, an opponent of Klein's reform efforts, who was presiding over the following session tried to prevent the vote. Thanks to the intervention of Guido Castelnuovo and Federigo Enriques, the motion was voted on and transmitted to the General Assembly of the International Congress of Mathematicians for its approval. On April 11, 1908, the afternoon General Assembly approved with "loud applause" (Castelnuovo 1909, Vol. 1, p. 32) the following agenda, adopted in the morning by the Fourth Section:

> The Congress, having recognized the importance of a careful examination of the syllabi and of the methods of teaching mathematics in the secondary schools of the various nations, entrusts the professors Klein, Greenhill and Fehr with the task to constitute an international Committee, which should study the question and report about it at the next Congress.[11]

With this act the International Commission on the Teaching of Mathematics was born. When comparing the initial vote of the Fourth Section (Castelnuovo 1909, p. 45) and the definitive vote (Castelnuovo 1909, p. 51 and p. 33), one is able to note remarkable differences between the two proposals: the general proposition became an outline for concrete activity, the committee became no longer permanent, and its task was limited until the next congress, 4 years later.

3.2 The Structure of the Commission

The task of organizing the Committee planned in Rome was hard since a similar structure did not exist before. First a three-man committee and later Central Committee,[12] to be complemented by national delegates, was formed. The members

[10] These papers were first presented during the conference celebrating the centenary of ICMI in Rome (see Menghini, Furinghetti, Giacardi, and Arzarello 2008, pp. 205–211 and 113–130, respectively).

[11] *Il Congresso, avendo riconosciuto la importanza di un esame accurato dei programmi e dei metodi d'insegnamento delle matematiche nelle scuole secondarie delle varie nazioni, confida ai Professori KLEIN, GREENHILL e FEHR l'incarico di costituire un Comitato internazionale che studii la questione e ne riferisca al prossimo Congresso*. (Castelnuovo 1909, Vol. 1, p. 33)

[12] In the document of the period, it was usually indicated as *Comité Central*. The French language, which was the most used language in *L'Enseignement Mathématique*, was the usual language for circulars and reports of the Commission.

were Klein, Fehr, and Alfred George Greenhill; they elected Klein as the president, Greenhill vice-president, and Fehr secretary-general. The presence of Klein was well justified by his international reputation as a mathematician and by his important involvement in the German reforms (Meran Syllabus). Fehr, who as an editor of *L'Enseignement Mathématique* had international contacts and information, had to be there. The presence of Greenhill in the committee, however, is quite surprising. Throughout his long scientific career, Greenhill received many honors, and in 1908, on his retirement from the Artillery College, he was knighted by King Edward VII. As reported by Rice (2008), he was a well-appreciated professor in applied mathematics, but his professional biography does not evidence a significant involvement in dealing with general problems of mathematics education. On the other hand, Greenhill "was also known and respected overseas, being on friendly terms with several continental mathematicians,[13] most notably Klein" (Rice 2008) and was a member of the *Comité de Patronage* of *L'Enseignement Mathématique* since its creation. Greenhill was one of the signatories of the letter of invitation to the International Congress of Mathematicians at Zurich in 1897 and was the first British scholar to give a plenary address at an International Congress of Mathematicians (at Heidelberg in 1904). In the words of Smith (as reported in Donoghue 2008,[14] pp. 38–39), "Greenhill was named because of his eminence in applied mathematics and because the next congress [was] to be held in England."

Smith joined the Central Committee in 1912 by decision of the International Congress of Mathematicians of Cambridge and at the request of the Central Committee (see Vol. 1, Hobson and Love 1913, p. 41). In the same year, a letter of Fehr proposed him as vice-president (Schubring 2008, p. 14). In his memoranda he wrote that:

> At the time of the nominations several suggestions were made in the meeting, to the end that I be a member. These I declined to consider, for the obvious reason that the success of the movement depended on the subjection of all personal feeling—that the best men should be named independent of the chance fact that one man suggested the matter, that another spoke upon the question at the meeting, and so on. (Donoghue 2008, p. 39)

Actually, as evidenced in Donoghue (2008) and in Schubring (2008), Smith had already played a fundamental role by bringing the three members of the Committee together, "essentially serving as the midwife for IMUK" (Schubring 2008, p. 6). In Rome he illustrated his ideas on the future work of the Commission to Fehr and Greenhill (Donoghue 2008, p. 39), and afterward he visited Klein in Gottingen to outline a plan. Then he prepared a draft which he reviewed with Klein as a basis for the discussion. A second draft by him was submitted to the three for the September 23–24 meeting of the commission in Cologne, where Smith was not present because

[13] O'Connor and Robertson (1997) write that "He spoke French rather well, and read German easily."

[14] Donoghue (2008) reports the quoted passages from: Smith, D. E. (n.d.). ICTM: Memoranda, notes, etc. *David Eugene Smith Professional Papers, Rare Book and Manuscript Library*. New York: Columbia University.

he had sailed on September 5, 1908, for New York, after an absence of 15 and a quarter months (Donoghue 2008, p. 41). The German teacher Walther Lietzmann was invited by Klein to work with him on the preparation for the meeting as well as to participate in it. This was the beginning of a fruitful collaboration between the two and of the involvement of Lietzmann in the activities of the Commission. In 1928, he was elected member of the Central Committee and in 1932 and 1936 vice-president of the Commission.

The meeting of Cologne marks the beginning of the proper work of the Central Committee and of the Commission. Since then the Central Committee has met regularly every year,[15] and from 1910 on, there have been general meetings of the entire Commission. The leading group was definitely acknowledged; the plan of the activity and the organization of the commission were settled.

The preliminary report, issued after the meeting, outlines the intentions and the expectations of what the Commission should become (Klein et al. 1908). Of course, these initial rules underwent changes due to changes of circumstances and contexts.

The structure was as follows (Klein et al. 1908, pp. 446–448):

- "Central Committee" as appointed in this role at the International Congress of Mathematicians of 1908, made up by the president (Klein), the vice-president (Greenhill), and the secretary-general (Fehr).
- "Participant countries," which participated in the work of the Commission with the right to vote:

  with two or three delegates (Germany, Austria, France, Great Britain, Hungary, Italy, Russia, Switzerland, the USA).

  with one delegate (Belgium, Denmark, Spain, Greece, Holland, Norway, Portugal, Romania, Sweden).

- "Associated countries," whose delegates (one for each country) could follow the activities of the Commission without having the right to vote. The initial list, which successively was enlarged, was composed of:

  Argentina, Australia, Brazil, Bulgaria, Canada, Chile, China, the Cape Colonies, Egypt, the Indian Raj, Japan,[16] Mexico, Peru, Serbia, and Turkey.

The rule was that the participant countries were those which had participated in at least two International Congresses of Mathematicians with an average of at least two

[15] In the report of the activities of the Commission at the International Congress of Mathematicians in Cambridge, Fehr (1912, p. 456) mentions the following meetings of the Central Committee: Cologne in September 1908, Karlsruhe beginning of April 1909, Basel end of December 1909, Brussels August 1910, Milan September 1911, Hahnenklee (Harz mountains) July 1912. Fehr (1910, p. 371) also mentions a meeting in Gottingen in April, 1910. Of course, there were also informal contacts. The most relevant issues resulting from these meetings are reported in Circular no. 1 signed by Klein and Fehr (1909) for the meeting in Carlsruhe (April 5–6, 1909) and Circular no. 2 signed by Klein and Fehr (1910) for the meeting in Basel (December 28, 1909).

[16] In *Circulaire* no. 4 (1911. *L'Enseignement Mathématique,* 13, 122–137) the mistake involving Japan was noticed later, and it was listed among the participant countries.

members. The countries which had an average of ten members or greater at the International Congresses of Mathematicians could have two or three delegates. However, during the discussions and the polls of the Commission, each country had only one vote. The delegations were invited to establish national subcommissions composed of representatives of the different levels of mathematical teaching in different types of institutes, including technical and professional schools. These subcommissions helped the delegates to elaborate the reports (Klein et al. 1908, p. 451).

The Central Committee was responsible for organizing the activities of the Commission and publishing its reports. *L'Enseignement Mathématique* was the official organ of the Commission. The sentence "*Organe officiel de la Commission internationale de L'Enseignement mathématique"* appears in the first issue of 1909. The official languages were those used at the International Congresses of Mathematicians: English, French, German, and Italian (Klein, Greenhill, and Fehr 1908, pp. 449–450).

Concerning financial aspects, the governments of the participant countries were asked to take charge of the fees of the delegations and the subcommissions. Moreover, these governments contributed with annual fees to the expenses of the Committee and the secretary-general. The delegates of the associated countries should arrange directly the financial questions with their governments. It is possible that the Commission asked for a contribution for its expenses from these countries (Klein, Greenhill, and Fehr 1908, p. 450). Through the years financial issues have been a problem for the Commission and have caused friction within the mathematical community.

At the meeting held in Carlsruhe (April 5–6, 1909), the national subcommissions of the various countries were defined: they were composed of representatives of all levels of instruction and of any type of schools, including professional schools (Klein and Fehr 1909, p. 196). The number of members on the national subcommissions was not fixed. The groups were encouraged to involve representatives of applied sciences such as physicists and engineers who were specialists in teaching. The delegates of 16 of the 18 countries to be represented in the Commission were appointed. They were (Klein and Fehr 1909, pp. 193–195[17]):

Germany: Felix Klein (University, Göttingen), Paul Staeckel (Polytechnic, Carlsruhe), Peter Treutlein (Secondary School, Carlsruhe)

Austria: Emanuel Czuber (Polytechnic, Vienna), Richard Suppantschitsch (Secondary School, Vienna), Wilhelm Wirtinger (University, Vienna)

Belgium: one delegate to be announced

Denmark: Poul Heegaard (Associate Inspector for mathematics in Secondary Schools)

Spain: Zoel García De Galdeano (University, Zaragoza)

The USA: David Eugene Smith (Columbia University, New York), William Osgood (Harvard University, Cambridge), Jacob William Albert Young (University, Chicago)

France: Albert de Saint Germain (University, Caen), Carlo Bourlet (Conservatoire des Arts et Métiers, Paris), Charles-Ange Laisant (Polytechnic, Paris)

[17] In this chapter the spelling of the surnames of people is reported as found in the cited documents.

Greece: Cyparissos Stephanos (University, Athens)
Holland: Jacob Cardinaal (Polytechnic, Delft)
Hungary: Emanuel Beke (University, Budapest), Gusztáv Rados (Polytechnic, Budapest), László Rátz (Secondary School, Budapest)
The British Isles: Alfred George Greenhill (College, Woolwich) and two delegates not yet appointed
Italy: Guido Castelnuovo (University, Rome), Federigo Enriques (University, Bologna), Giovanni Vailati (Technical Secondary School, Florence)
Norway: Olaf Alfsen (Secondary School, Christiania)
Portugal: Gomes Teixeira (Polytechnic, Porto)
Romania: Georges Tzitzeica (University, Bucharest)
Russia: Nikolay Ya. Sonin (Ministry of Education, St. Petersburg), Boris Kojalovic (Technological Institute, St. Petersburg), Karl W. Vogt (Director of the Second Real School, St. Petersburg)
Sweden: Helge von Koch (Polytechnic, Stockholm)
Switzerland: Henri Fehr (University, Geneva), Carl Friedrich Geiser (Polytechnic, Zurich), Johann Heinrich Graf (University, Bern)

The previous list underwent integrations and changes. In the meeting of Basel, Joseph Jean Baptiste Neuberg, retired from Liège University, was appointed as Belgian delegate, and Gaetano Scorza, at that time Secondary teacher and afterward a University professor, substituted for Vailati, who died in 1909 (see Klein and Fehr 1910, p. 124). In the meeting of Brussels (August 10–16, 1910), Greenhill reported that the Board of Education had appointed Ernest William Hobson (University, Cambridge) and Charles Godfrey (Naval College, Osborne) as the UK delegates and had, thus, settled the national subcommission (see Fehr 1910, p. 363). In 1912 Albrecht Thaer (Secondary School, Hamburg) succeeded Peter Treutlein, who died in the same year; after the resignation of Zoel García De Galdeano, Cecilio Jiménez Rueda (University of Madrid) was appointed as delegate of Spain; Fujisawa Rikitarō (University, Tokyo) was made the Japanese delegate (see Fehr 1912, pp. 453–454). In France, following the death of Bourlet and the resignation of de Saint Germain and Laisant, Jacques Hadamard (Institut de France, Polytechnic and Collège de France, both in Paris), Maurice d'Ocagne (Polytechnic, Paris), and Charles Bioche (Secondary School, Paris) were appointed delegates (see Fehr 1913, p. 490). In Russia, following the demise of Vogt, Konstantin A. Posse (Emeritus of University, St. Petersburg) was appointed (Fehr 1913, pp. 489–490). During the meeting in Heidelberg (July 21–23, 1913), the number of members of the Central Committee was increased from four to seven with the addition of Castelnuovo (Italy), Czuber (Austria), and Hadamard (France) (Fehr 1913, p. 490). Fehr (1914, p. 179) reports the following changes happened in 1914: Edvard Göransson (Secondary School, Stockholm) succeeded von Koch and Luis-Octavio de Toledo (University, Madrid) was appointed as Spanish delegate after Rueda.

In the list of the members of the Commission published in (Fehr 1914, p. 166), the delegates of the following associated countries are also included: Australia, Brazil, Bulgaria, the Cape Colonies, Egypt, Mexico, and Serbia. The list of the publications of the Commission (Fehr 1920–1921, p. 339) shows that two participant countries (Greece and Norway) did not produce materials, while two associated countries (Argentina and Australia) did.

Most delegates were mathematicians coming from higher education. As pointed out by Schubring (2003) this fact was positive since fostered harmony between mathematics and the field of education. On the other hand, it overshadowed the perspective of mathematics teaching in the schools. Klein worked to prevent the dominance of higher education mathematics in this forum. In the national subcommissions, however, Primary and Secondary teachers were often present.

3.3 The Aims and the Plan of Work

In accordance with the intentions expressed in Rome at the moment of its founding, the general aim of the Commission was stated in these terms: "Make an inquiry and publish a general report on the current trends in the teaching of mathematics in various countries."[18] This aim had to be realized by looking for general principles that inspire teachers rather than trying to identify uniform details or propose programs suitable for all countries. It was not the task of the Commission to produce statistics. As illustrated by Schubring (2003, pp. 57–58), the Commission enlarged into international comparative reports the exclusively descriptive tasks voted on by the General Assembly in Rome. These reports illustrated the trend of teaching a few key topics that represented the major reform concerns. Moreover, the school level reported on was not confined to Secondary Schools but extended to all levels of schooling and all types of Secondary instruction. It included not only those aimed at preparing for university or polytechnic but also professional and technical schools as well.

The reports concerning the inquiry were prepared by the delegates of the participant countries and their national subcommissions. They could be collective or individual. The Commission encouraged national subcommissions promoting meetings with teachers, scientific societies, and all those interested in the advancement of mathematics teaching. Accurate bibliographies were recommended. The reports were optional for the associated countries. All materials were expected to be ready for the International Congress of Mathematicians in 1912.

The object of the inquiry consisted of two parts (Klein, Greenhill and Fehr 1908, pp. 451–458). The first part was an overview of the "current situation of the organization and of the methods of mathematical instruction"[19] concerning the following points:

- The various kinds of schools.
- Aim of mathematics instruction and branches of mathematics taught in the various kinds of schools.
- Exams.

[18] *Faire une enquête et publier un rapport général sur les tendances actuelles de l'enseignement mathématique dans les divers pays*. (Klein, Greenhill and Fehr 1908, p. 450)

[19] *Etat actuel de l'organisation et des méthodes de l'instruction mathématique.*

- Teaching methods.
- The training of prospective teachers.

The second part was devoted to outline “Modern trends in the teaching of mathematics”[20] relative to the points listed above. While the first part consisted mainly of acknowledging the state of art in the instruction of the various countries, in the second part, the Commission was able to outline main ideas and wishes for future reforms.[21] In regard to this, it is interesting to compare the few lines devoted to the comment that accompanied Chap. IV in the first part, on the present state of the methods of teaching (ibid., p. 454), with the considerable space dedicated to the same issue in the second part on modern trends (ibid., pp. 455–457). This comment is a kind of manifesto of the matters of mathematics education that were discussed throughout the twentieth century:

- The role of psychology in Primary and Secondary mathematics education.
- Logic and intuition.
- Concrete materials, models.
- Mathematical laboratory.
- Popularization of mathematics, museums.
- Widespread beliefs about mathematics.
- Links among the different branches of mathematics.
- Links with other disciplines.
- The place of history of mathematics in teaching.

Enlarging the target of the inquiries to all school levels from the original target, which in Rome was confined to only Secondary School, was in line with Klein’s view of mathematics education as expressed in his autobiography where he pointed out that the mathematics teaching, from its very beginnings at elementary school right through to the most advanced level research, should be organized as an organic whole (Klein 1923, p. 24). In practice, however, for quite some time, the Commission’s main attention was paid to Secondary level onward, with the early years of school being neglected. Bearing this in mind, it is useful to examine Laisant’s reaction to Smith’s speech entitled “Intuition and experiment in mathematical teaching in the Secondary Schools” delivered in 1912 at the International Congress of Mathematicians at Cambridge (UK) (Fehr 1912, pp. 507–528). Smith discussed how intuition in mathematics teaching was approached in different countries with students aged between 10 and 19 in Secondary Schools, excluding vocational ones. According to Laisant the question was posed in a wrong way. He claimed that the role of intuition and experiment in education, especially

[20] *Les tendances modernes de l’enseignement mathématique.*

[21] Some lexical changes reveal the different approaches of the first part concerning the *status quo* and the second part which projected into the future. In the first part, it is recommended to consider the “*écoles des jeunes filles*” (girls schools) (p. 453), and in the second, the recommendation becomes to consider “*la question de la coéducation des deux sexes*” (the question of the coeducation of the two sexes) (p. 454).

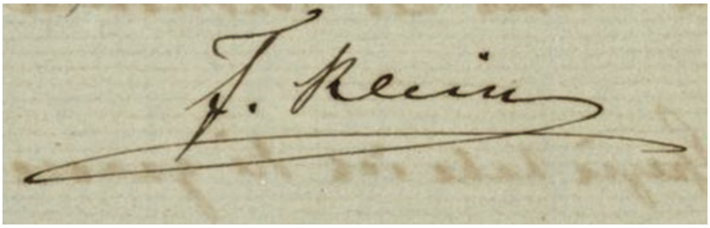

Fig. 1.1 Klein's signature from a letter dated April 30, 1878, sent to Placido Tardy, professor of infinitesimal analysis and *rettore* at the University of Genoa. (Courtesy of *Biblioteca Universitaria di Genova*)

mathematics education, is one of the main problems of pedagogy. For him, confining the examination of this problem to Secondary Schools makes the problem unsolvable since the physiological and psychological conditions of the brain development are disregarded (Fehr 1912, pp. 528–529).

Behind the plan of the Commission, there was the strong personality of Klein. As a matter of fact, since his early years as professor, he showed a great interest in mathematics education. As pointed out by Rowe (1983, pp. 450–451), the *Erlanger Programm* was accompanied by an educational program which outlined pedagogical principles and goals for Klein's future academic activity. In his autobiography Klein (1923, p. 18) discussed his *Erlangen Antrittsrede* and stressed its main points:

- The unity of all knowledge so that humanistic and mathematical-scientific education belong together.
- The necessity of cultivating applied mathematics as well as pure, in order to preserve the connection between neighboring disciplines such as physics and technology.
- Alongside the development of logical capability the role of intuition and, more generally, mathematical imagination.
- Education of school teachers.

4 The Golden Age of the International Commission on the Teaching of Mathematics: Meetings, Inquiries, and Reports

4.1 The Dress Rehearsal for International Conferences on Mathematics Teaching: The Brussels Meeting (1910)

A turning point in the activities of the Commission was the meeting held in Brussels (August 9–10, 1910) on the occasion of the Universal Exhibition. The meeting was held together with other events concerning mathematics teaching organized according to the following schedule (Fehr 1910, pp. 353–354):

- Session of the Central Committee (August 9).
- Session of the delegates and the members of the national subcommissions (August 10 until 4 pm; afterward began the following listed public sessions).
- Talks on scientific teaching in Germany (August 11–12).
- Talks on technical teaching in French Secondary Schools (August 13–14).
- International congress on Secondary teaching (August 15–16).

In the session devoted to the Commission, Fehr presented a general survey of the work of the Commission, and various member states presented their reports. In his opening address to the public session, Klein focused on the role and aims of the Commission. He made particular reference to the national subcommissions and their reports. Klein identified three types of reports: those based on the method of systematic exposition, such as the French description of the mathematical instruction in the various school levels; those based on the statistical method, such as the inquiries carried out in the USA; and those based on monograph-length studies, such as those produced by Germany, on general problems of didactics. In the public session, Bourlet delivered a talk on the intertwining of pure and applied mathematics in Secondary teaching entitled "*La pénétration réciproque des enseignements des mathématiques pures et des mathématiques appliquées dans l'enseignement Secondaire*" (The reciprocal penetration of courses in pure and applied mathematics in Secondary teaching) (Fehr 1910, pp. 372–387)**.** This theme was not only central in Klein's concern but also close to the spirit of the meeting which was influenced by the technical and industrial advancements of society.

The talks delivered on August 11–12 concerning scientific teaching in Germany were organized by the *Verein zur Förderung des mathematischen und naturwissenschaftlichen Unterrichts* [Society for the advancement of mathematical and scientific teaching] with the patronage of the Prussian Ministry for Education (Fehr 1910, pp. 387–393). The contributions by Peter Treutlein and Klein are noteworthy. Treutlein presented his method for teaching geometry aimed at developing pupils' intuition as well as models produced by the Teubner firm in Leipzig. Klein presented works already published in Germany through the International Commission on the Teaching of Mathematics. He then illustrated the models produced in Germany, in particular the Brill and Schilling models and their use in teaching advanced mathematics and helping pupils develop geometric intuition. This topic was of great interest for Klein because of its link with the themes of intuition and rigor. Already, in the Chicago Congress, he had devoted two afternoons to the presentation and discussion of models (Tayler 1893, p. 19), and in the talks he delivered in Evanston, Klein touched on the themes of intuition and rigor (Gray and Rowe 1993, pp. 32–33).

In August 13–14 Bourlet organized a set of talks on technical teaching in French Secondary Schools with the patronage of the *Ministère du Commerce et de l'Industrie de France* (Ministry of Trade and Industry of France) (Fehr 1910, pp. 393–412). Bourlet himself was one of the speakers; he spoke about the progress of the Schools of Aviation in France as well as French aviation itself. Visits to the French exhibits on aviation, electricity, and machineries were also in the program's schedule.

The final event in Brussels was the international congress on Secondary teaching held on August 15–16. There were three talks by Belgian speakers, two by French speakers, and one by a German speaker on aspects of instruction on their respective countries. During the general session, two themes that had a real international character were discussed: the creation of a "*Bureau international des Fédérations de l'enseignement Secondaire*" (International bureau of the Federations of Secondary teaching) and an "*Office international d'échange de jeunes gens*" (International office of exchange of young people) (Fehr 1910, p. 414). This last initiative was aimed at promoting the study of foreign languages.

4.2 The Conference in Milan (1911)

In line with the initiative launched in Brussels, a conference on mathematics teaching was organized in Milan (September 18–21, 1911). It followed the same pattern as the Brussels meeting. A part of the program was devoted to the meeting of the Central Committee, the presentations of the works of the national subcommissions, and the plan for the participation in the International Congress of Mathematicians at Cambridge in 1912. Another part of the program was focused on topics relevant to the study of trends in mathematics education to complement the national reports submitted. There had been a preliminary meeting in February at Karlsruhe where the Central Committee decided that in addition to the national reports, it was useful to concentrate the debate on two important questions, one concerning Secondary School and one concerning higher. The questions were the following (Fehr 1911a, p. 122; 1911b, pp. 443–446):

A. I. To what extent can the systematic exposition of mathematics in Secondary Schools (lyceums, colleges, gymnasia, real schools) be taken into account? – II. The question of the fusion of the different branches of mathematics in Secondary Schools.
B. The mathematics teaching, theoretical and practical, to students of physical and natural sciences.[22]

The following special subcommissions were appointed the task of preparing brief reports as a base for discussion in the congress:

A. Middle school teaching: Emanuel Beke, Charles Bioche, Felix Klein, Walter Lietzmann, Gaetano Scorza, Jacob William Albert Young.
B. Higher education: Carlo Bourlet, Henri Fehr, Felix Klein, Carlo Somigliana, Heinrich Timerding, Wilhelm Emil Wirtinger.

[22] A. *Dans quelle mesure peut-on tenir compte dans les écoles moyennes (lycées, collèges, gymnases, écoles réales,* etc.*) de l'exposé systématique des mathématiques? – La question de la fusion des différentes branches mathématiques dans l'enseignement moyen.*

B. *L'enseignement mathématique, théorique et pratique, destine aux étudiants en sciences physiques et naturelles.* (Fehr 1911, p. 122)

The secretary, Fehr, sent a letter to both subcommissions illustrating the themes proposed: Lietzmann,[23] for subcommission A, and Timerding, for subcommission B, derived themes from the reports which would later be discussed in Milan.

In the proceedings of the congress, Fehr (1911b) defines it as "*le 1er Congrès International de l'Enseignement mathématique*" (the first International Congress of Mathematics Teaching) (p. 439). According to Schubring (2008) the congresses of this period can be considered the first ICMEs (International Congresses on Mathematical Education). Indeed, for their structure the congresses of Milan and the successors in Paris were similar to the ICMI Studies launched in 1984 because the activities of the meeting were based on previously prepared documents.

In the first day of the Congress, the Central Committee, together with the delegates of the principal countries, designated Castelnuovo, Bioche, and Timerding as rapporteurs on the questions A (I and II) and B, respectively.

Castelnuovo spoke on rigor in mathematic teaching in Secondary Schools (*La rigueur dans l'enseignement mathématique dans les écoles moyennes*, Fehr 1911b, pp. 461–468, including the discussion). For sure, Italy was a suitable place for discussing this issue, which had been debated extensively since the appearance of the first textbook of geometry in the new-born state.[24] Castelnuovo confined his analysis to geometry, on which there was such a wide competence in his country that Smith (1900, p. 304) claimed "Italy has produced some excellent works on elementary geometry; indeed, in some features it has been the leader." He considered only high schools with a humanistic orientation, which in Italy were the most prestigious type of school (*licei classici*). He classified the different degrees of rigor and mentioned some authors who employed different methods in their treatises as follows:

- Purely logical method (Peano, Hilbert, Halsted, and others).
- Method based on empirical principles followed by logical development. In this method there are different orientations:
  - All necessary axioms are stated (Sannia-D'Ovidio, Veronese, Enriques-Amaldi, and others).
  - Only some axioms are stated (Euclid, Thieme).
  - Only the axioms with no absolute obviousness are stated (Kambly, Müller).
- Intuitive and deductive considerations are alternated (Borel, Behrendsen-Götting, and others).
- Intuitive-experimental method: the theorems are presented as having an intuitive character or are proved through experiments (Perry, and others).

[23] The portrait by Schubring in Furinghetti and Giacardi (2008) mentions Lietzmann's interest in the problem of rigor as well as the studies he carried out about the Italian approach to this issue.

[24] As Godfrey (1912) pointed out in his report on Milan Conference, in Italy the concept of rigor had changed since the times of the first textbook based on Euclid and published in 1867–1868. According to him for the Italians rigor did not mean Euclid, but Peano and Hilbert, while in Germany intuition was widely used and rigor was confined to the university.

Klein, Giuseppe Veronese, Enrico d'Ovidio, Bourlet, Hobson, Erwin Dintzl, Lietzmann, and Enriques made comments. Castelnuovo and some participants indicated which of the different methods were used in various countries. Young presented a careful report about the situation in his country in terms of rigor and fusion (Fehr 1911b, pp. 471–481).

Bioche presented the report on the question of the fusion of different branches of mathematics in secondary schools ("*La question de la fusion de différentes branches mathématiques dans l'enseignement moyen*," Fehr 1911b, pp. 468–471). He defined the meaning of "fusionist" and "purist." Afterward, he gave examples of fusion between algebra or arithmetic and geometry, planimetry and stereometry, planimetry and trigonometry, stereometry and descriptive geometry, synthetic geometry and analytic geometry, and differential and integral calculus. He referred in particular to practices in Austria, Italy, Germany, France, and England. He quoted, among other texts, the three outstanding fusionist manuals of geometry by Charles Méray, Giulio Lazzeri,[25] and Carl Anton Bretschneider.

Timerding (Braunschweig) reported on theoretical and practical mathematics teaching to students of physical and natural sciences ("*L'enseignement mathématique théorique et pratique destiné aux étudiants en sciences physiques et naturelles*," Fehr 1911b, pp. 481–496). He addressed the issue from a theoretical point of view, presenting a schematization of the disciplines according to the role that mathematics may play. These disciplines were listed under the title of "humanities," e.g., statistics, political economy, etc., and "nature," e.g., physics, zoology, etc. Afterward, he described the unsatisfactory situation surrounding the attempts to meet the needs of students of physical and natural sciences in Germany, Austria, and England. He claimed that in France, Italy, and Russia, the situation was better. Klein reacted by proposing to deepen the subject by looking more closely at physics and engineering students. Bourlet, Wirtinger, Fehr, and Boris Cojalowitsch (also known as Coialovich, Kojalovic, Koyalovich) outlined the situations in France, Austria, Switzerland, and Russia, respectively.

Timerding's final reaction outlined the main problems of mathematics instruction to students of physical and natural sciences. He stressed two issues as a starting point for identifying fruitful trends in teaching. The first is the fusion not only between the different branches of mathematics but also between mathematics and closely related disciplines such as mechanics, physics, chemistry, and political economy. The second question concerns the method of teaching to the special students in question. He quoted the case of differentials, which are not the same for mathematicians as for physicists or chemists. The question is how to deal with it: to consider it at the beginning of the course or to use a rigorous approach all along. Moreover, in general what is better: to teach with examples, to use experimental methods, or to use partial induction instead of deduction?

[25] This manual was written together with Anselmo Bassani.

These questions can be seen as a key-structuring dimensions of the activities of the Central Committee. Indeed, they were revisited and deepened in the following meetings in Cambridge (1912) and in Paris (1914).

In the last day of scientific work, before the final day of the excursion, there was a plenary session featuring two talks. Giuseppe Colombo, Senator of the Kingdom of Italy and rector of the Polytechnic of Milan, which hosted the conference, spoke on mathematics teaching for prospective engineers ("*Sull'insegnamento matematico nelle scuole per gli ingegneri*," Fehr 1911b, pp. 499–504). Enriques enlarged the scope of the themes faced in the conference by analyzing the relation between mathematics and theories of knowledge ("*Mathématiques et théorie de la connaissance*," Fehr 1911b, pp. 505–509).

4.3 The Commission at the International Congress of Mathematicians in Cambridge (UK, 1912)

The fifth International Congress of Mathematicians, held at Cambridge (UK, August 21–27, 1912), was the first official occasion in which mathematicians could examine and evaluate the work of the Commission since its creation in Rome. In a preparatory meeting in July at Hahnenklee, the Committee, together with Carl David Tolmé Runge from Gottingen and Smith, had planned the activities of the Commission at Cambridge (Fehr 1912, p. 443). The action of the Commission, indeed, was one of the themes discussed in the first general meeting (Hobson and Love 1913, Vol. 1, pp. 37–38), and in the final meeting of the Congress, the work of the commission created in Rome was acknowledged (Hobson and Love 1913, Vol. 1, p. 41). About 280 reports had been sent to the Central Committee from many countries (see the list of publications, Hobson and Love 1913, Vol. 2, pp. 642–653). Since many countries had not sent completed versions of their respective reports, the task of the Commission was not accomplished. In the July meeting at Hahnenklee, a demand was prepared to prolong the mandate until the next Congress, which was approved in its final meeting. The Central Committee appointed in Rome (Klein, Greenhill, Fehr) was confirmed in charge with the addition of Smith, on request of the Central Committee.

In the fourth section of the Congress, dedicated to didactics,[26] the Commission presented its activities from 1908 to 1912 with the list of publications from various countries (first session). In the second and third sessions, the reports on the following themes were presented (Hobson and Love 1913, Vol. 2, pp. 591–653):

[26] In the Congress there were four sections. In the fourth section, entitled *Philosophy, history, didactics* (Hobson and Love 1913, Vol. 2, pp. 447–653), there were 29 contributions split into the following subsections: *a* and *b* (*Philosophy, history, didactics*, ibid., Vol. 2, pp. 447–458), *a* (*Philosophy, history*, ibid., Vol. 2, pp. 459–541), and *b* (*Didactics*, ibid., Vol. 2, pp. 543–653).

A. Intuition and experimental evidence in Secondary School mathematics teaching.
B. Mathematics in physics. Mathematical knowledge useful to physicists and required by them[27].

According to Fehr (1912, p. 443), the sessions of the Commission at Cambridge may be considered the second international congress of mathematics teaching after that of Milan. For health reasons Klein did not attend the Congress. Fehr presented a report on the activities of the Commission (meetings, decisions, publications), and the work of each national subcommission was presented by one of the delegates of the corresponding country.

The organization of the reports on topics A and B was carried out as in Milan Congress with the difference that the rapporteurs, Runge and Smith, were chosen in advance, not decided during the Congress as happened in Milan. As mentioned previously, they took part in the preparatory meeting in July at Hahnenklee. Two subcommissions had been appointed before the Congress for preparing the discussion.

Subcommission B was assembled by Klein (president), Bourlet, Fehr, Greenhill, Coialovich, Tullio Levi-Civita, Runge, Timerding, Arthur Gordon Webster, and Wirtinger. The topic was a continuation of that planned in Milan as theme B with the exclusion of engineering students: the mathematical training of the physicist in the university. In the winter of 1911–1912, a circular letter was sent out to collect necessary information. The French version of the questionnaire proposed by Runge is reported in Fehr (1912, pp. 500–501). Answers arrived from Austria, Germany, Italy, Holland, Switzerland, England, and the USA.

Runge presented the report "The mathematical training of the physicist in the University" (Fehr 1912, pp. 495–507, including the discussion; Hobson and Love 1913, Vol. 2, pp. 598–603). He started by stressing that comparisons are made difficult by the different contexts involved. Nevertheless from the inquiry, he could conclude that the trends in teaching and the related problems were similar. The main problem was that usually the mathematicians who taught to physics students did not understand the needs and the problems of the physicist. He suggested that some parts of theoretical mathematics should be put aside in favor of parts that are used in applying mathematics to physics. Runge paid particular attention to graphical methods which were not yet used for dealing with functions. This was a hot theme of the period, and among the reactions, there was that of George Alexander Gibson, author of the book *An Elementary Treatise on Graphs* (1904). Runge suggested using the slide rule, calculating machines, and other devices which are both useful for physics and mathematics students. He also mentioned the mathematical laboratory.

[27] A) *L'intuition et l'expérience dans l'enseignement mathématique de Ecoles moyennes.* B) *Les mathématiques en physique. Connaissances mathématiques utiles aux physiciens et réclamées par ceux-ci.* (*L'Enseignement Mathématique,* 1912, 14, p. 39).

These themes essentially treated variations of the themes discussed in Milan.

According to Fehr (1912, p. 502) the discussion which followed Runge's speech was one of the most interesting of the Congress. There were 13 discussants from several countries: Paul Gustav Samuel Staeckel, Bourlet, Enriques, Greenhill, Webster, Joseph Larmor, Bioche, Love, Hobson, Gibson, Joseph John Thomson, Runge himself, and Frederick William Lanchester. They were either mathematicians or physicists. Some supported a logical approach in addition to the utilitarian, and some complained of a loss of intuition due to the excessive development of the algorithmic aspects.

Smith presented the report "Intuition and experiment in mathematical teaching in the Secondary Schools" (Fehr 1912, pp. 507–534, including the discussion; Hobson and Love 1913, Vol. 2, pp. 611–632). The method of investigation was similar to that of Runge's report. In 1911 the Central Committee appointed subcommittee A, which was charged with the duty of investigating the role of intuition in Secondary mathematics. Lietzmann prepared a questionnaire that was to secure the data upon which to base a report. The questionnaire was sent out during the winter of 1911–1912, and replies were received by April 1, 1912, from representative teachers of Austria, England, France, Germany, Switzerland, and the USA. The French version of the questionnaire proposed by Lietzmann on behalf of the subcommission Commission A is reported in Fehr (1912, pp. 527–528). The following persons replied: Dintzl (Austria), Godfrey (England), Bioche (France), Treutlein and Lietzmann (Germany), Fehr (Switzerland), Smith, and Young (USA). On July 1 Smith was assigned the duty of preparing the report.

The method of investigation differed from country to country. In some cases the rapporteur sent out local questionnaires; in others he referred to the printed reports of the International Commission; in still others a committee considered the replies. A footnote in the text points out that the words "intuition" and "experiment" do not translate correctly the original German topic assigned "Anschauung und Experiment im mathematischen Unterricht der höheren Schulen." The elusiveness of the concepts of intuition and experiment was an actual problem, as was proven by the reaction of George St. Lawrence Carson (England) in the discussion.

Smith's speech can be considered to complement Castelnuovo's analysis on rigor presented in Milan and is oriented toward classroom practice. There was an initial part describing various types of schools, excluding vocational ones, for pupils in Secondary Schools aged from 10 to 19. Afterward, the situations in the various countries were outlined. In Austria, Germany, and Switzerland, the teaching of mathematics valued intuition more than in England, France, and the USA. The most debated subjects were the teaching of geometry and the introduction of the concept of function. Smith analyzed some particular activities in the teaching of mathematics that were touched in the questionnaire: "measuring and estimating" (geodetic, astronomical measurements, triangulations, etc.), "geometric drawing and graphic representation," "graphic methods" (representation of functions on graph paper, graphic statics, evaluation of surfaces with the aid of graph paper, etc.), and "numerical computation" (the use of tables, of the slide rule, methods of approximate calculation, etc.).

In the animated discussion that followed Smith's presentation, there was the criticism from Laisant mentioned before that intuition and experiment needed to be studied more broadly. Moreover Thaer and Lietzmann added further information about Germany, Dintzl did the same for Austria, Bioche for France, Arthur Warry Siddons and Carson for England, and Karl (also known as Charles, Károly) Goldziher for Hungary. Walther Franz Anton von Dyck stressed the role of the Commission in arousing the interest of mathematicians concerning this important teaching problem.

In the section on didactics, Goldziher (Budapest) presented the contribution "*Bericht über die Herausgabe einer Bibliographie des mathematischen Unterrichts 1900–1912*" (Report on the publication of a bibliography for the teaching of mathematics, Fehr 1912, pp. 535–536; Hobson and Love 1913, Vol. 2, pp. 608–610), which illustrated the booklet by Smith and Goldziher (1912) prepared for the Cambridge Congress and distributed free of charge to the participants. This booklet lists 1849 works which addressed mathematics teaching from different countries and were published in the period 1900–1912.

4.4 The Conference in Paris (1914)

In 1914 (April 1–4) the Commission met in Paris. The plan of the meeting followed the pattern of Cambridge. The main aim was to discuss the two questions (A and B) reported below, the first concerning Secondary School and the second the advanced level:

A. The results obtained by the introduction of differential and integral calculus into the upper years of middle school (rapporteur Beke).
B. The place and role of mathematics in higher technical instruction (rapporteur Staeckel)[28].

A preparatory meeting was held in Heidelberg (July 21–23, 1913). In addition to the members of the Central Committee, there were Bourlet,[29] who was in charge of the practical organization of the congress, and the two rapporteurs Beke and Staeckel. Two questionnaires in the four official languages of the CIEM were prepared (*L'Enseignement Mathématique*, 1913, 15, pp. 394–412 and in *Publications du Comité Central*. s. 2, 2). The plan of the congress was to have:

[28] A. *Les résultats obtenus dans l'introduction du Calcul différentiel et intégral dans les classes supérieures de l'enseignement moyen*.

B. *La place et le rôle des mathématiques dans l'enseignement technique supérieur*. (*L'Enseignement Mathématique*, 1913, 15, pp. 394–395)

The translations into German, English, and Italian of the questions were published in *L'Enseignement Mathématique* (1913, 15, pp. 394–412).

[29] He could not accomplish the task because died in August 12 (*L'Enseignement Mathématique*, 1914, 16, p. 54)

- A preliminary meeting of the members of the Commission and of subcommissions A and B.
- Two public sessions, one for topic A and one for topic B.
- Two sessions of discussion reserved for the members of the Congress.

The sessions took place at the Sorbonne. More than 160 people from 17 countries were present. After Paul Émile Appell's welcome address and Fehr's report on the activities and publications of the Commission (Fehr 1914, pp. 178–184; 192), Castelnuovo, replacing Klein absent for health problems, delivered the opening speech illustrating the mission and vision of the CIEM (Fehr 1914, pp. 188–191, including the discussion). Subsequently, Jean Gaston Darboux recalled the poor situation of mathematics curriculum in old times and praised the French reform of 1902 which made the place of scientific teaching adequate for modern times (Fehr 1914, pp. 192–197). He outlined the main changes in secondary school teaching:

- The introduction of differential and integral calculus.
- The systematic use of transformations in geometry.
- The place given to applications and the exclusion of the problems which do not have their roots in reality.
- The development of students' involvement and the focus on a good education of the mind.

Borel and d'Ocagne delivered the two final lectures of the general session. The first discussed the adaptation of Secondary teaching to the progress made in the sciences ("*L'adaptation de l'enseignement Secondaire aux progrès de la science*," Fehr 1914, pp. 198–210, including the discussion). He acknowledged that Secondary teaching evolves slowly; nevertheless, he advocated that two centuries of progress in mathematics should not be neglected and that early introduction of differential and integral calculus was critical for its usefulness and its educational value.

D'Ocagne emphasized the role of mathematics in the education of engineers ("*Le rôle des mathématiques dans les sciences de l'ingénieur*," Fehr 1914, pp. 211–222, including the discussion). He supported his belief of the importance of mathematics in engineering sciences with a number of examples taken from different situations which illustrated the intertwining of theory and practice in the work of the engineers.

The four working sessions were devoted to the presentation and the discussion of the reports on questions A and B.

Beke reported on the results of the introduction of integral and differential calculus in the upper grades of Secondary institutions ("*Les résultats obtenus dans l'introduction du calcul différentiel et intégral dans les classes supérieures des établissements Secondaires*," Fehr 1914, pp. 245–284). The theme was very important since some elements of calculus were present in all reforms implemented in the previous 12 years. Among the 15 states which sent reports, the following had elements of infinitesimal calculus in the official syllabi or in the curricula drawn up by schools themselves: some German states (Bavaria, Württemberg, Baden, Hamburg), Austria, Denmark, France, the British Isles, Italy, Romania, Russia, Sweden, and Switzerland. In Australia, Hungary, Prussia, and Saxony, these elements were taught in many schools; it was planned to teach them in Belgium, Holland, Norway, and Serbia.

Beke illustrated the main points concerning the introduction of calculus: applications, the question of rigor, the relationship between calculus and other subjects, and, finally, the reactions from Secondary and university teachers. He reported that according to Klein, the textbooks of infinitesimal calculus were lacking in rigor. This was one of the reasons that university professors were frustrated by their attempts to include calculus in their teaching, while Secondary School teachers appeared more enthusiastic. Beke suggested that the academic world support the reform movement by collaborating with Secondary School teachers and by writing textbooks (Fehr 1914, p. 279). He concluded his talk by mentioning *humanités scientifiques* (scientific humanities) and the strong educational value of mathematics.

Bioche spoke on the teaching of infinitesimal calculus in the French lyceums and on the results that it obtained ("*L'organisation de l'enseignement du calcul des dérivées et des fonctions primitives dans les lycées de France et sur les résultats obtenus*," Fehr 1914, pp. 285–306, including the discussion). This talk added information which completed the French report of 1911 to the Commission. After the detailed description of the French situation, Bioche concluded that the introduction of differential and integral calculus could present great advantages if these notions were introduced gradually and if the acquired notions were used for practical applications.

The talks were followed by the discussion. The delegates of Germany, the USA, Hungary, Italy, Romania, Russia, and Serbia provided further information on the situations in their countries. The contributions of Adolphe Buhl, Alessandro Padoa, Hadamard, Castelnuovo, Possé, Thaer, Georges Fontené, Darboux, and Enriques were then made. The focus was mainly on rigor and curriculum content. Jules and Paul Tannery's textbook entitled *Notions de mathématiques* (1902. Paris: Librairie Delagrave) was proposed as an example of good curricular content. Extracts from the national reports of Germany, Austria, and the British Isles were published in the proceedings (Fehr 1914, pp. 302–306).

Staeckel's talk concerned the mathematical preparation of engineers in various countries ("*La préparation mathématique des ingénieurs dans les différents pays*," Fehr 1914, pp. 307–356, including the discussion). He explained the two different systems for training engineers: in most countries there were technical universities, while in the others, the preparation was carried out in traditional universities, in some cases supported by special schools. Staeckel focused on types of teaching, contents, methods, and books. A main point was the appropriate qualification of the teachers, for instance, whether they should be mathematicians or to be engineers.

In the discussion following the talk, the main debated questions were degrees of rigor and methods in teaching. The various discussants of the question A agreed that on one hand, a solid mathematics background is necessary, but on the other hand, too specialized or purely theoretical aspects have to be neglected.

5 The Crisis and the Dissolution

The years after 1914 were turbulent not only for society but also for the scientific community. In 1894, the editors of *L'Intermédiaire des Mathématiciens* had written that science is the great peacemaker.[30] However events proved that this belief was optimistic. The tragedy of World War I was followed by a difficult period of resettling within the international relationships of the scientific community. Lehto (1998, pp. 16–21) describes the escalation of the events that led to a ban of scientists from the Central Powers from international cooperation and associations. The action was initiated by the French Darboux and Émile Picard in 1916 and was made official in the two meetings of London in October 9–11, 1918 (C. G. K. 1918) and Paris in November 26–29, 1918 (Picard and Lacroix 1918), where it was planned the constitution of the International Research Council (IRC) (Lehto 1998, pp. 16–19). The Constitutive Assembly of the IRC held at Brussels on July 18–28, 1919, ratified the postwar international science policy of exclusion and the dissolution of all organizations that had been constituted with the membership of the now defeated countries (Lehto 1998, pp. 19–21). During the Constitutive Assembly held in Brussels, a session was devoted to preparing the foundation Statutes of the International Mathematical Union (IMU). Draft Statutes of the IMU were approved by the participants, and an Interim Executive Committee of the IMU was elected. Two days before the beginning of the sixth International Congress of Mathematicians, on September 20, 1920, France, the UK, Italy, Belgium, the USA, Czechoslovakia, Greece, Portugal, Serbia, Japan, and Poland met in a hall of the University of Strasbourg and confirmed the Statutes of the IMU that were presented in Brussels (Lehto 1998, pp. 24–25; Villat 1921, p. xxxv): thus the International Mathematical Union was founded. Strasbourg, the town belonging again to France after the war, had been proposed by France as a venue for the sixth International Congress of Mathematicians as opposed to Stockholm, which was the planned location before the war. The invitations were sent individually by the French National Committee (Villat 1921, pp. xxxiv-xxxix). The new ideology based on the restriction of internationalism affected the atmosphere of the Congress. The tensions provoked by the war were not overcome, as proved by the claim made by Picard in his concluding talk at Strasburg, "Crimes without name leave in the history of the guilty nations a blemish that signatures at the bottom of a peace treatise cannot delete."[31]

These events were in the background throughout the life of the International Commission on the Teaching of Mathematics and ultimately led to its dissolution. On April 28, 1914, it was decided that the next meeting of the Commission should take place in August 2–5, 1915, in Munich. The theme to be discussed was the theoretical and practical education of mathematics teachers in different countries.

[30] "*La Science est la grande pacificatrice*" (Les directeurs 1894, p. VIII).

[31] *Des crimes sans nom vont laisser dans l'histoire des nations coupables une tache, que des signatures au bas d'un traité de paix ne sauraient laver*. (Villat 1921, p. xxxi)

Loria (University of Genoa) was charged with presenting a general report on Secondary School. Klein, Fehr, and Loria met in Gottingen in July 23–26, 1914, to prepare for the meeting in Munich and for the next International Congress of Mathematicians in 1916 in Stockholm where the last work of the Commission was to be presented. Thus the task and mandate given by the Congress of 1908 would be completed. Unfortunately, on August 1, World War I began. The scheduled meeting in Munich was canceled. The same thing happened to the International Congress of Mathematicians scheduled in Stockholm.

Despite the opinion of Klein, who pushed for the publication of the questionnaire on the ongoing research on teachers, Fehr hesitated before publishing it owing to the difficulties of some subcommissions due to the war. Eventually, the questionnaire for the inquiry into the education of teachers of mathematics in Secondary Schools in different countries was published (in the four official languages) in *L'Enseignement Mathématique* (1915, 17, pp. 60–65 in French; 1915, 17, pp. 129–145 in German, English, Italian, and in *Publications du Comité Central*. s. 2, 4).

The exchange of messages reported in Schubring (2008)[32] shows that Klein proposed to end the work of the Commission or dissolve the commission and hoped for its reestablishment under new conditions. Without consulting the Central Committee, in the November issue of *L'Enseignement Mathématique* (1914, 16, pp. 477–478, actually published at the end of December), Fehr announced the postponement of the work of the Commission during the war. Moreover, in a letter of December 28, 1914, Fehr invited Klein to leave his post as president to Smith and to step back to the position of vice-president of the Commission. This proposal was not realized; Smith and Castelnuovo supported Klein. In the end Klein formally remained president. Fehr's request was due the fact that in October 1914, Klein, together with 93 German intellectuals and scientists, had signed the document "*Aufruf an die Kulturwelt*," which supported German military actions in the early period of First World War.

Some national subcommissions continued their work even during the war years, though the Commission did not meet. Reports of their work and papers on Secondary School teacher education were published in *L'Enseignement Mathématique* (Belgium, 1916, 18, pp. 335–352; Germany, 1916, 18, pp. 353–361; USA, 1916, 18, pp. 427–439; Argentina, 1920, 20, pp. 281–304; Bolivia, 1921–1922, 22, pp. 286–290). In 1919 the annual volume of *L'Enseignement Mathématique* was not issued; two volumes appeared for the years 1920–1921 and 1921–1922.

According to Schubring (2008) from 1915, the correspondence between the members of the Central Committee was rare and inexistent between Fehr and Klein until 1920. Events during the aftermath of the war and the imminence of the International Congress of Mathematicians in Strasbourg forced the members of the Central Committee of the Commission to resume discussion on how to proceed. Fehr took note of the exclusion of the former Central Powers (*L'Enseignement*

[32] All information about correspondence among the members of the central Committee is taken from the article Schubring (2008).

Mathématique, 1918, 20, pp. 294–297; 1920–1921, 21, pp. 59–60) from international cooperation. This made the relationship inside of the Central Committee difficult. The first contact after the war was established by Fehr but only with the members of the Central Committee belonging to the victorious Allied countries. In a letter dated March 31, 1919, he told Smith that the Commission could not continue to function as originally constituted, because of the policy of exclusion decided upon in the London and Paris meetings. Therefore, the representatives of the Central Powers had to be excluded. He said that the French and Italian "delegations" were in agreement with this action. He proposed that Smith be president and that the most recent project on teacher education be continued. Smith accepted. In his reply dated September 2, 1919, Fehr reported that he had consulted with the members of the Central Committee,[33] except for Klein and Czuber, about the question of the presidency. He said that due to the decisions at the interallied conference in Brussels, it was not possible to continue the activity of the Commission and to have Smith as president. Fehr's behavior in urging the dissolution of the Commission can be explained by an intertwining of private feelings (his attitude toward the Central Powers and his penchant for French culture and scientists) and international events, such as the exclusion of the Central Powers from most international scientific activities.

Schubring (2008, pp. 25–27) reports on the discussion about the presence of the Commission at the International Congress of Mathematicians in Strasbourg. In letters dated April 28, 1920, to Klein and July 20, 1920, to Fehr, Smith put forward the question of presenting a report on ICMI at Strasburg. Klein was contrary to the idea of presenting a report. In the end, Fehr and Klein agreed that the work of the Commission could not be mentioned at Strasbourg, because the congress was not a regular International Congress of Mathematicians but an irregular one – due to the exclusion of mathematicians from the defeated countries.

Fehr, Greenhill, and Smith participated in the Congress at Strasbourg, but the Commission was not mentioned, and its mandate was not renewed (Villat 1921).

Having received Klein's agreement on July 10, 1920, Fehr formulated a letter, predated July 5 to the entire Commission informing them of the liquidation process. In April 1921, he announced the dissolution of the International Commission on the Teaching of Mathematics in *L'Enseignement Mathématique* (1920–1921, 21, pp. 317–318). He made the decision after consulting with each member of the Central Committee on how to proceed in view of the new conditions on official international scientific relations, which required the dissolution or the reorganization of international commissions established before the war. As before, the services of *L'Enseignement Mathématique* were available for supporting international cooperation. The national subcommissions were permitted to continue with their reports which could be sent to *L'Enseignement Mathématique* for publication. In the same issue of the journal (pp. 305–337), Fehr reported on the activities of

[33] The answer from Greenhill is missing.

the Commission from 1908 to 1920, including the list of publications (see Appendix 2) of the Central Committee and of the national subcommissions of the Argentine Republic, Australia, Austria, Belgium, the British Isles, Denmark, France, Germany, Holland, Hungary, Italy, Japan, Romania, Russia, Spain, Sweden, Switzerland, and the USA.

The process of liquidating the Commission was carried out according to the four steps outlined by Fehr (letter to Klein of June 1, 1920) and approved by Klein (letter to Fehr of June 8, 1920).

- The secretary-general informs the members of the forthcoming liquidation and invites them to complete all final work.
- Publishing the complete list of all reports given.
- Clearing of all financial issues.
- Sending a closing circular to the members, including, in particular, the financial report (Schubring 2008, p. 25).

Finally, on September 6, 1921, Fehr sent all members a last circular, the final report as published in the journal *L'Enseignement Mathématique* (Fehr 1920–1921) and reminded members to pay any missing contributions. This was the last action of the Commission.

The International Congress of Mathematicians at Toronto (Canada) from August 11–16, 1924, was held in the spirit of making science really international again, although Germany was still absent. In the sixth section of the Congress, entitled *History, philosophy, didactics*, two different presentations, which concerned pedagogy, both mentioned the Commission. One was by the Swiss Louis Jacques Crelier (Fields 1928, Vol. 2, pp. 973–974) and the other one was by Fehr (Fields, p. 987).

6 The Rebirth and Smith's Presidency

At the meeting of June 29, 1926, the International Research Council decided to invite Austria, Bulgaria, Germany, and Hungary to become members of the Council and of the Unions attached to it again. The German scientists declined the invitation. In 1928 the International Congress of Mathematicians was held in Bologna (Italy), on September 3–10. In this congress the exclusion policy of the International Mathematical Union was formally rejected (Lehto 1998, p. 41), and Germany was readmitted, though after some harsh controversies (*Atti del Congresso* 1929, Vol. 1, pp. 5–10).

The sixth section was entitled *Matematiche elementari, Questioni didattiche, Logica matematica* (Elementary mathematics, Didactical questions, Mathematical logic, *Atti del Congresso* 1929, Vol. 3, pp. 373–458). In his communication, the Greek Nilos Sakellariou (*Atti del Congresso* 1929, Vol. 3, pp. 457–458) proposed the constituting of an international commission for the teaching of mathematics.

In the second session of the sixth section, Fehr (*Atti del Congresso* 1929, Vol. 1 pp. 106–113) described the activities of the Commission since its foundation. This session marked the actual renewal of the activity of the Commission at the international level for the first time since the meeting held in Paris in 1914. The sixth section, under the chairmanship of Castelnuovo, submitted an agenda for the Congress's approval asking that the Commission be reconstituted in such a way that all the countries participating in the Congress have representation. The extension of the mandate of the Central Committee with the addition of a new member was also proposed (*Atti del Congresso*, Vol. 1, p. 113). In the new Commission, there were changes since Klein died in 1925, as did Czuber in 1926 and Greenhill in 1927, but the continuity with the early Commission was ensured because the Central Committee consisted of people who were present before the war (President Smith, Vice-Presidents Castelnuovo and Hadamard, Secretary-General Fehr). Moreover, the added member, appointed by the Central Committee, was Lietzmann, who had been a strict collaborator with Klein on didactic questions (Fehr 1929, p. 49). Again, the official languages were German, English, French, and Italian, and the official organ was *L'Enseignement Mathématique* (Fehr 1931, p. 290). The newly reconstituted Commission asked for the support of the national governments.

Schubring (2008) describes the exchange of letters between the members of the Commission, showing the difficulties of both the organization of the new Commission and the launching of new ideas. For the next International Congress of Mathematicians in Zurich, it was decided to resume the inquiry on teacher training already launched in 1914. A reviewed version of the related questionnaire was published (*L'Enseignement Mathématique* 1931, 30, pp. 291–296 and in *Publications du Comité Central*. s. 4, 1933–1934).

Loria, who had already worked at the task in 1914, delivered the report in Zurich (Loria 1932). Its full text was published in *L'Enseignement Mathématique* (Loria 1933). In the same issue, the reports by the national delegations were also published, some of which had already appeared in journals of their respective countries: Austria, Belgium, Czechoslovakia, Denmark, England, France, Germany, Hungary, Italy, Norway, Poland, Switzerland, the USA, and Yugoslavia (*L'Enseignement Mathématique,* 1933, 32, pp. 169–254; pp. 360–400). A full account of the meeting of the Commission in Zurich (September 7–9, 1932, held during the International Congress of Mathematicians) and of the study on teacher training is published in *Publications du Comité central rédigées par H. Fehr, La préparation théorique et pratique des professeurs de mathématiques de L'Enseignement secondaire dans les divers pays* (Genève 1934).

With the study presented at International Congress of Mathematicians at Zurich, the projects launched by the old Commission before the First World War were finally finished. In this International Congress of Mathematicians, Smith (1932) presented a plan for the future. The context was changed as international events, such as the worldwide economic depression which started in 1929, were not favorable for raising interest in educational innovation and expansion. The reconstituted Commission carried out the old agenda with no truly new ideas or projects until the tragic outbreak of the Second World War.

7 Epilogue

The official table of publications reported in Appendix 2 shows the impressive activity carried out by the Commission in its early years before the First World War. It lists 187 volumes, 300 reports, and 13,565 pages. In some countries the subcommissions organized collective and thorough works; in others there was only one author for the report. The publications of the Commission are important documents for studying the situations in different countries in the first two decades of the twentieth century. The chapters of this volume that are devoted to the national subcommissions illustrate to what extent the action of the Commission fostered reforms and local reflections on mathematics teaching problems.

The Commission was an efficient model for establishing international cooperation based on the following practices:

- A network of information and communication.
- An organizational structure with precise rules.
- Reference points for the study of mathematics education: a journal as an official organ, international inquiries, and international meetings for discussing them
- Involvement at national level through the production of reports on mathematics teaching.

The limits to the actions of the Commission were connected to its origin inside the community of mathematicians and to its dependence on this community through the mandate given every four years during the International Congresses of Mathematicians. The great majority of people working in the Commission in that period were mathematicians, and their point of view was dominant. This had some consequences, for example, little attention was paid to Primary and Lower Secondary levels. Nevertheless, in tackling teaching problems mathematicians were forced to look at the school world with different eyes and to interact with some school teachers, who collaborated on national reports and participated in international meetings open to a large audience. This was the beginning of a slow journey for shaping the identity of the mathematics teacher as researcher. In these facts we see the germs of the evolution toward the creation of mathematics education as a scientific discipline that sprouted some decades after (Furinghetti, Matos, and Menghini 2013).

Appendix 1

Central Committees of CIEM/IMUK (Commission Internationale de L'Enseignement Mathématique/Internationale Mathematische Unterrichtskommission).

1908–1912	
President	Felix KLEIN (Germany)
Vice-President	George GREENHILL (UK)
Secretary-General	Henri FEHR (Switzerland)
1912–1920	
President	Felix KLEIN (Germany)
Vice-Presidents	George GREENHILL (UK), David Eugene SMITH (USA)
Secretary-General	Henri FEHR (Switzerland)
Members (co-opted in 1913)	Guido CASTELNUOVO (Italy), Emanuel CZUBER (Austria), Jacques HADAMARD (France)
1928–1932	
President	David Eugene SMITH (USA)
Vice-Presidents	Guido CASTELNUOVO (Italy), Jacques HADAMARD (France)
Secretary-General	Henri FEHR (Switzerland)
Member	Walter LIETZMANN (Germany)
1932–1936, 1936–	
President	Jacques HADAMARD (France)
Vice-Presidents	Poul HEEGAARD (Norway), Walter LIETZMANN (Germany), Gaetano SCORZA (Italy)
Secretary-General	Henri FEHR (Switzerland)
Member (co-opted in 1932)	Eric Harold NEVILLE (UK)

Appendix 2

Table 1.1 Publications of the Commission (*Atti del Congresso* 1929, Vol. I pp. 109–110)[34]

	Pamphlets or volumes	Number of papers	Pages
Central Committee	11	19	561
Germany	53	53	5571
Argentine Rep.	1	1	24
Australia	1	6	79
Austria	13	12	776
Belgium	2	5	366
Denmark	1	10	107
Spain	3	10	165
USA	18	18	1499
France	5	45	674
Holland	1	13	151
Hungary	9	9	294
British Isles	32	39	921
Italy	10	11	268
Japan	2	16	788
Romania	1	1	16
Russia	7	11	295
Sweden	8	8	229
Switzerland	9	13	781
	187	**300**	**13,565**

[34] This table was firstly published in Fehr's report on the activities of the Commission (Fehr 1920–1921, p. 339). In the version of 1929, the mistake in the sum of the number of papers is amended (in 1920–1921 it was 310 instead of 300).

References

Atti del Congresso Internazionale dei Matematici. (1929). Bologna: N. Zanichelli. Six volumes.

Auvinet, Jérôme. 2013. *Charles-Ange Laisant. Itinéraires et engagements d'un mathématicien de la Troisième République*. Paris: Hermann Éditions.

Behnke, Heinrich. 1951-1954. Participation of the Commission in the Amsterdam Congress, 1954. Preparatory Work. *L'Enseignement Mathématique* 40: 81–90.

Brigaglia, Aldo. 1984. Sur les relations des mathématiciens français et italiens au début du XXe siècle. *Cahiers du séminaire d'histoire des mathématiques* 5: 21–48.

C. G. K. 1918. Inter-allied conference on international organisations in science. *Nature* 102(256): 325–327.

Castelnuovo, Guido. ed. 1909. *Atti del IV Congresso Internazionale dei Matematici* (Rome, 1908). Roma: Tipografia della R. Accademia dei Lincei. Three volumes.

Donoghue, Eileen F. 2008. David Eugene Smith and the founding of the International Commission on the Teaching of Mathematics. *International Journal for the History of Mathematics Education* 3(2): 35–45.

Fehr, Henri. ed. 1910. Compte rendu des séances de la Commission et des conférences sur l'enseignement scientifique et sur l'enseignement technique moyen. *L'Enseignement Mathématique* 12: 353–415. Also *Circulaire* 3, *Publications du Comité Central*.

Fehr, Henri. 1911a. *Circulaire* 4. *L'Enseignement Mathématique* 13: 122–137. Also *Publications du Comité Central*.

Fehr, Henri. ed. 1911b. Compte rendu du Congrès de Milan 18-21 September 1911. *L'Enseignement Mathématique* 13: 437–511. Also *Circulaire* 5, *Publications du Comité Central*.

Fehr, Henri. ed. 1912. Compte rendu du Congrès de Cambridge 21-27 août 1912. *L'Enseignement Mathématique* 14: 441–537. Also *Publications du Comité Central*. s. 2, 1.

Fehr, Henri. 1913. Commission Internationale de l'Enseignement Mathématique. *L'Enseignement Mathématique* 15: 489–490.

Fehr, Henri. ed. 1914. Compte rendu de la conférence internationale de l'enseignement mathématique Paris 1–4 Avril 1914. *L'Enseignement Mathématique* 16: 165-226; 245-356. Also *Publications du Comité Central*. s. 2, 3.

Fehr, Henri. ed. 1920-1921. La Commission internationale de l'enseignement mathématique de 1908 à 1920. Compte rendu sommaire suivi de la liste complète des travaux publiés par la Commission et les Sous-commissions nationales. *L'Enseignement Mathématique* 21: 305–342. Also *Publications du Comité Central*. s. 2, 5.

Fehr, Henri. 1929. Le congrès de Bologne 3-10 septembre 1928. *L'Enseignement Mathématique* 28: 28–53.

Fehr, Henri. 1931. Commission international de l'enseignement mathématique. Renseignements généraux. *L'Enseignement Mathématique* 30: 289–290.

Fields, John Charles. ed. 1928. *Proceedings of the International Mathematical Congress*. Toronto: The University of Toronto Press. Two volumes.

Furinghetti, Fulvia. 2003. Mathematical instruction in an international perspective: The contribution of the journal *L'Enseignement Mathématique*. In *One hundred years of L'Enseignement Mathématique, L'Enseignement Mathématique* Monographie 39, eds. Daniel Coray, Fulvia Furinghetti, Hélène Gispert, Bernard R. Hodgson, and Gert Schubring, 19–46. Geneva: *L'Enseignement Mathématique*.

Furinghetti, Fulvia. 2008. Mathematics education in the ICMI perspective. *International Journal for the History of Mathematics Education* 3(2): 47–56.

Furinghetti, Fulvia. 2009. The evolution of the journal *L'Enseignement Mathématique* from its initial aims to new trends. In "*Dig where you stand". Proceedings of the conference on "On-going research in the History of Mathematics Education"*, eds. Kristín Bjarnadóttir, Fulvia Furinghetti, and Gert Schubring, 31–45. Reykjavik: University of Iceland – School of Education.

Furinghetti, Fulvia, and Giacardi, Livia. 2008. *The first century of the International Commission on Mathematical Instruction (1908-2008). The history of ICMI*. http://www.icmihistory.unito.it/.

Furinghetti, Fulvia, Matos, José M., and Menghini, Marta. 2013. From mathematics and education, to mathematics education. In *Third International Handbook of Mathematics Education*, eds. McKenzie A. Clements, Alan Bishop, Christine Keitel-Kreidt, Jeremy Kilpatrick, and Frederick K. S. Leung, 273-302. Dordrecht – Heidelberg – London - New York: Springer.

Gerretsen, Johan C. H., and De Groot, Johannes. eds. 1957. *Proceedings of the International Congress of Mathematicians 1954*. Groningen E. P. Noordhoff N. V. - Amsterdam: North-Holland Publishing CO.

Godfrey, Charles. 1912. On the work of the International Commission on Mathematical Teaching. *The Mathematical Gazette* 6(97): 243–246

Gray, Jeremy J., and Rowe, David E. 1993. Felix Klein at Evanston: Learning, teaching and doing mathematics in 1893. *For the Learning of Mathematics* 13(3): 31–36.

Hobson, Ernest William, and Love, Augustus Edward Hough. eds. 1913. *Proceedings of the fifth International Congress of Mathematicians*. Cambridge: Cambridge University Press. Two volumes.

Howson, Geoffrey A. 2001. INTERNATIONAL SYMPOSIUM «One hundred years of L'Enseignement Mathématique. Moments of mathematics education in the 20th century». *L'Enseignement Mathématique* 47: 181–183.

Klein, Felix. 1896. The present state of mathematics. In *Mathematical papers read at the international mathematical congress held in connection with the World's Columbian Exposition Chicago 1893*, eds. Eliakim Hastings Moore, Oskar Bolza, Heinrich Maschke, and Henry S. White, 133–135. New York: Macmillan and co. for the American Mathematical Society (Vol. I).

Klein, Felix. 1923. Göttinger Professoren. Lebensbilder von eigener Hand. 4. Felix Klein, *Mitteilungen des Universitätsbundes Göttingen* 5: 11–36.

Klein, Felix, and Fehr, Henri. 1909. Circulaire n. 1. *L'Enseignement Mathématique* 11: 193–204. Also *Publications du Comité Central*.

Klein, Felix, and Fehr, Henri. 1910. Circulaire n. 2. *L'Enseignement Mathématique* 12: 124–139. Also *Publications du Comité Central*.

Klein, Felix, Greenhill, George and Fehr, Henri. 1908. Rapport préliminaire sur l'organisation de la Commission et plan générale de ses travaux. *L'Enseignement Mathématique* 10: 445–458. Also in *Publications du Comité Central*.

La Rédaction. 1905. Réformes à accomplir dans l'enseignement des mathématiques. *L'Enseignement Mathématique* 7: 382–387; 462–472. Reactions by Gino Loria (pp. 383–386), Émile Borel (pp. 386–387), Jules Andrade (pp. 462–469), David Eugene Smith (pp. 469–471), and Francisque Marotte (pp. 471–472).

Laisant, Charles-Ange, and Lemoine, Émile. 1894. *L'Intermédiaire des Mathématiciens* 1: 113.

Lehto, Olli. 1998. *Mathematics without borders: A history of the International Mathematical Union*. New York: Springer Verlag.

Les directeurs. 1894. Préface. *L'Intermédiaire des Mathématiciens* 1: V–VIII.

Loria, Gino. 1932. La préparation théorique et pratique des professeurs de mathématiques de l'enseignement secondaire. Rapport général. In *Verhandlungen des Internationalen Mathematiker-Kongresses Zürich 1932*, ed. W. Saxer, Vol. 2, 363. Zürich – Leipzig: O. Füssli.

Loria, Gino. 1933. Commission internationale de l'enseignement mathématique. La préparation théorique et pratique des professeurs de mathématiques de l'enseignement secondaire dans les divers pays. I. Rapport général. *L'Enseignement Mathématique* 32: 5–20.

Menghini, Marta, Furinghetti, Fulvia, Giacardi, Livia, and Arzarello, Ferdinando. eds. 2008. *The first century of the International Commission on Mathematical Instruction (1908–2008). Reflecting and shaping the world of mathematics education*. Rome: Istituto della Enciclopedia Italiana.

Moore, Eliakim Hastings, Bolza, Oskar, Maschke, Heinrich, and White, Henry S. eds. 1896. *Mathematical papers read at the international mathematical congress held in connection with the World's Columbian Exposition Chicago 1893*. New York: Macmillan and co. for the American Mathematical Society (Vol. I).

O'Connor, John J., and Robertson, Edmund F. 1997. Alfred George Greenhill. *MacTutor History of Mathematics archive*, University of St Andrews. http://www-history.mcs.st-andrews.ac.uk/Biographies/Greenhill.html

Parshall, Hunger Karen, and Rowe, David E. 1993. Embedded in the culture: Mathematics at the World Columbian Exposition of 1893. *Mathematical Intelligencer* 15(2): 40–45.
Picard, Émile, and Lacroix, Alfred. 1918. La Conférence interalliée des Académies à Londres. *Comptes Rendus des Séances de l'Académie des Sciences* 107: 566–570.
Rice, Adrian. 2008. Alfred George Greenhill. In *The first century of the International Commission on Mathematical Instruction (1908-2008). The history of ICMI*, ed. Fulvia Furinghetti and Livia Giacardi. http://www.icmihistory.unito.it/.
Rowe, David E. 1983. A forgotten chapter in the history of Felix Klein's *Erlanger program*. *Historia Mathematica* 10: 448–457.
Schubring, Gert. 2003. *L'Enseignement Mathématique* and the first international commission (IMUK): The emergence of international communication and cooperation. In *One hundred years of L'Enseignement Mathématique, L'Enseignement Mathématique* Monographie 39, eds. Daniel Coray, Fulvia Furinghetti, Hélène Gispert, Bernard R. Hodgson, and Gert Schubring, 47–65. Geneva: *L'Enseignement Mathématique*.
Schubring, Gert. 2008. The origins and the early history of ICMI. *International Journal for the History of Mathematics Education* 3(2): 3–33.
Smith, David Eugene. 1900. *The teaching of elementary mathematics*. New York, London: Macmillan
Smith, David Eugene, and Charles Goldziher. 1912. *Bibliography of the teaching of mathematics 1900-1912*. United States Bureau of Education, *Bulletin* 29.
Smith, David Eugene. 1932. Compte rendu de la réunion de Zurich (7-9 septembre 1932) *L'Enseignement Mathématique* 31: 260–267.
Tayler, Harry Walter. 1893. The mathematical congress at Chicago. *Bulletin of the New York Mathematical Society* 3: 14–19.
Villat, Henri. ed. 1921. *Comptes rendus du Congrès International des Mathématiciens*. Toulouse: É. Privat (Librairie de l'Université).

Websites

https://www.e-periodica.ch/digbib/volumes?UID=ens-001
http://www.mathunion.org/Publications/historic-material

Chapter 2
The French Subcommission of the International Commission on Mathematical Instruction (1908–1914): Mathematicians Committed to the Renewal of School Mathematics

Renaud d'Enfert and Caroline Ehrhardt

Abstract The focus of this chapter is the French Subcommission of the International Commission on Mathematical Instruction, particularly its commitment to modernizing teaching practices and its fight for the democratization of the teaching of mathematics in France. The chapter shows that the subcommission totally supported the reforms introduced in the teaching of mathematics in France in the early twentieth century. The first part of the chapter studies the French subcommission and the authors of the series of reports that were compiled in preparation for a general report on progress in the teaching of mathematics in the various countries of the world presented at the 1912 International Congress of Mathematicians. Analysis thus shows a pluralist, open mathematical environment that was not restricted to learned elite groups. It also demonstrates that the members were not only experts in the field of teaching but also keen to make the work of the International Commission on Mathematical Instruction more widely known. The second part of the chapter analyzes the nature of the mathematics promoted by the French Subcommission, as presented in the reports mentioned above. It highlights the determination of the members to promote a common – and resolutely modern – mathematical culture for all the sectors making up the education system in France at the time.

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When the International Commission on Mathematical Instruction (ICMI) was created in 1908 (which led to the creation of its French Subcommission – *Sous-Commission Française* – SCF), education in France had already been the subject of a long series of transformations that had begun at the start of the Third Republic (Prost 1968; Chapoulie 2010). In the early 1880s, primary school (*école primaire*) – the "people's school" – had been made free, nonreligious, and compulsory for children between the ages of 6 and 13. The "higher primary schools" *(écoles primaires supérieures*), which offered a further 3 years of study, were substantially developed thereafter. Secondary education for boys, dispensed in secondary schools (either in *collèges* or in *lycées,* which were more prestigious), was mainly intended for the children of the bourgeoisie. During the same period, it had seen the gradual institutionalization of a modern sector that promoted the sciences and modern languages alongside the traditional classical sector that focused on the study of Ancient Greek and Latin. The major reform of secondary education carried out in 1902 acknowledged its equivalent value. Public secondary education for girls had been almost nonexistent up to this point. It also began to be organized in the 1880s (but did not include Ancient Greek and Latin). Technical education took on a real structure, particularly from the 1890s onward, with the creation of practical schools of trade and industry (*écoles pratiques de commerce et d'industrie*) – for boys and for girls – under the supervision of the Ministry of Trade. It was also in the 1870–1880s that the higher education dispensed at the universities began to be deployed substantially. It notably placed emphasis on preparing students for public and competitive examinations leading to the qualifications (*"licence"* degrees and the *"agrégation"* competitive examination) that provided access to employment as a secondary school teacher (Gispert 1991).[1] In the 1880s the provincial faculties of sciences also began to create technical institutes in order to train engineers for industry (Rollet 2009; Nabonnand 2006).

A further aspect to be borne in mind is that, at the time ICMI was created, the education system in France was still in the throes of a comprehensive reorganization and was the subject of serious desire for reform. Thus, in addition to restructuring the curriculum, the 1902 reform in secondary education also considerably increased the importance of the sciences – including mathematics – in the balance of the subjects taught: further adaptations were made in 1905, 1909, and 1912 as the result of various objections. In the same way, the curriculum of the primary teacher training colleges (*écoles normales primaires*) had been revised in 1905, and it was now the turn of the curriculum of the higher primary schools, with a number of aspects of the

[1] According to Gispert (1991), the number of students in science was multiplied by almost 30 between 1876 and 1896.

1 The French Subcommission: Diversity, Expertise, and Commitment

The SCF, set up in 1909, had forty members. It was headed by a "bureau" comprising the members of the French Delegation to the Central Committee of the International Commission on Mathematical Instruction. During the first few years of its existence, its main activity was the drafting of a series of reports constituting France's contribution to the "general report on current trends in the teaching of mathematics in the various countries" which was to be presented at the International Congress of Mathematicians held in Cambridge in 1912. In addition to the members of the SCF, 13 other contributors took part in this collective editorial work, which was published in 1911 (CIEM-SCF 1911a, b, c, d, e). These 50 or so contributors, representing mathematics in France in all its diversity as required by the International Commission on Mathematical Instruction (CIEM 1908), were all particularly committed to their subject and experts in the field of teaching (CIEM 1910, p. 131: see Tables 2.1 and 2.2).

1.1 Representatives of the Diversity of Mathematics in France

Let us begin by taking a look at the bureau of the SCF. Its initial members were Paul Appell (1855–1930), Carlo Bourlet (1866–1913), and Charles-Ange Laisant (1841–1920). Albert de Saint-Germain (1839–1914) eventually headed it in 1909, replacing Paul Appell, because of the latter's "multiple occupations."

The first three of this group are well known to historians of mathematics. Paul Appell, a *"normalien"* (i.e., a former student at the *École Normale Supérieure* in Paris) in the 1873 year group, was at the time professor of rational mechanics at the Faculty of Sciences in Paris and had been dean of the Faculty since 1903. In the course of his career, he had in fact had many other "occupations" that had made him a central figure in mathematical circles in early twentieth-century France: he had been the president of the French Mathematical Society (*Société Mathématique de France* – SMF) and of the French Association for the Advancement of Science (*Association Française pour l'Avancement des Sciences* – AFAS). He had also been a member of the *Académie des Sciences* since 1893. But Paul Appell was a mathematician with a social and political conscience. He had sided with the Republicans and had been one of the first signatories of the Manifesto of the Intellectuals in support of Captain Dreyfus in 1898, before being called as an expert when the historic legal case was reviewed in 1906 (Charle 1990; Rollet 2010).[2] Appell had also taken

[2]Alfred Dreyfus (1859–1935), a Jewish artillery officer who had been wrongly convicted of treason for the benefit of Germany in 1894. From 1898, many "intellectuals" protested against the verdict: the "Dreyfus affair" divided the French society into two camps (the Dreyfusards and the anti-Dreyfusards) and gave rise to strong reactionary and anti-Semitic movement. See Duclert (2006); Charle (1990).

1902 reform being incorporated (d'Enfert 2003). For the practical schools, new curricula were discussed between 1905 and 1908 and implemented in 1909 (Allart 2014). The changes also involved the educational approach adopted: teaching of the sciences, and mathematics in particular, was henceforth to be more specific, more intuitive, and more "experimental." The circle of science teachers, who wished to contribute to the debate opened by the 1902 reform and, in many cases, wanted to promote the new approach to the teaching of science that the reform sought to bring about, began to take on a structure of its own. Thus in 1910 the Association of Teachers of Mathematics in Public Secondary Education (*Association des Professeurs de Mathématiques de l'Enseignement Secondaire Public* – APMESP) was founded in order to "study matters touching on the teaching of mathematics" and defend "the professional interests of its members" (quoted in Barbazo 2010, p. 13). The organization of the education system in France into highly compartmentalized parallel sectors (primary, secondary, technical, etc.) was nevertheless beginning to be contested. More particularly, the "social" definition of secondary education and its restrictions that barred pupils from primary schools attracted substantial criticism: "The logic of democracy demands that the equality of children in terms of access to education become a legal and social reality," wrote the educationalist and radical socialist member of parliament Ferdinand Buisson in 1911 (Buisson 1911, p. v).

As we shall see, at the time of its creation, the SCF – as much by its composition as by its achievements – totally supported the reforms that were being introduced in the teaching of mathematics in France in the early twentieth century. In contrast with the rich scholarly literature regarding these reforms, however, the history of the SCF has not been specifically and systematically explored (even if few authors mention it, see Nabonnand 2006; Nabonnand 2007; Barbazo 2010; Auvinet 2013). This chapter aims to highlight the commitment not only to mathematics and teaching methods but also to the democracy that was expressed within the SCF during the short period of its existence (the SCF does not seem to have survived the First World War). The first part of the chapter will cover the members of the SCF and the authors of the series of reports it compiled in preparation for the International Congress of Mathematicians to be held in 1912, at which a general report on progress in the teaching of mathematics in the various countries of the world was to be presented. Analysis shows a pluralist, open mathematical environment that was not restricted to learned elite groups alone and, in addition to being competent in the field of teaching, was keen to make more widely known the work of the International Commission on Mathematical Instruction. The second part of the chapter analyzes the nature of the mathematics promoted by the SCF, as presented in the reports mentioned above; there is also evidence of a determination to provide a common – and resolutely modern – mathematical culture for all the sectors making up the education system in France at the time.

Table 2.1 The French subcommission of the CIEM in 1910

Name	Institution	Participation in the 1911 reports
Amieux, Anna	Lycée Victor-Hugo, Paris	Vol. 5 – Girls education
André, Désiré	Collège Stanislas, Paris [retired]	
Appell, Paul (président d'honneur)	Faculté des Sciences, Paris	Vol. 4 – Technical education; Vol. 5 – Girls education
Baudeuf, Henriette	Lycée de jeunes filles, Bordeaux	Vol. 5 – Girls education
Béghin, Henri	École navale, Brest	Vol. 2 – Secondary education
Bertier, Georges	École des Roches, Verneuil-sur-Avre	
Bézine, Edouard	École d'Arts et Métiers, Aix-en-Provence	Vol. 4 – Technical education
Bioche, Charles (vice-secrétaire)	Lycée Louis-le-Grand, Paris	Vol. 2 – Secondary education
Blutel, Émile	Lycée Saint-Louis, Paris	Vol. 2 – Secondary education
Borel, Émile	Faculté des Sciences, Paris	Vol. 3 – Higher education; Vol. 4 – Technical education
Bourlet, Carlo (vice-président, trésorier)	Conservatoire national des Arts et Métiers, Paris	
Carvallo, Emmanuel	École Polytechnique, Paris	
Chancenotte, Jean-Augustin	École normale d'instituteurs, Dijon	
Fort, Louis	École navale, Brest	
Fredon, Léontine	École pratique de commerce et d'industrie, Le Havre	Vol. 5 – Girls education
Gilles, Athanase	Inspection générale de l'instruction publique (enseignement primaire), Paris	
Goursat, Édouard	Faculté des Sciences, Paris	Vol. 1 – Primary education
Guitton, Ernest	Lycée Henri IV, Paris	Vol. 2 – Secondary education
Harang, Fernand	École pratique d'industrie, Saint-Étienne	Vol. 4 – Technical education
Kœnigs, Gabriel	Faculté des Sciences, Paris	Vol. 5 – Girls education
Lagneaux, Charles	École professionnelle Diderot, Paris	Vol. 4 – Technical education
Laisant, Charles-Ange (secrétaire)	École Polytechnique, Paris	
Lebois, Claude	Inspection générale de l'enseignement technique, Saint-Etienne	
Lefebvre, Jules	Inspection générale de l'Instruction publique (enseignement primaire), Paris	Vol. 1 – Primary education
Marotte, Francisque	Lycée Charlemagne, Paris	
Matray, Jean-Marie	École professionnelle, Nantes	
Muxart, André	Lycée [de garçons], Amiens	Vol. 2 – Secondary education

(continued)

Table 2.1 (continued)

Name	Institution	Participation in the 1911 reports
Pivot, Clélie	École professionnelle Émile Dubois, Paris	Vol. 5 – Girls education
Rollet, Paul	École professionnelle Diderot, Paris	
Roumajon, Joseph	École d'Arts et Métiers, Aix-en-Provence	Vol. 4 – Technical education
Rousseau, Théophile	Lycée [de garçons], Dijon	Vol. 2 – Secondary education
Saint-Germain, Albert de (président)	Faculté des Sciences, Caen	Vol. 3 – Higher education
Tallent, Gustave	École primaire supérieure Turgot, Paris	Vol. 1 – Primary education; Vol. 5 – Girls education
Tannery, Jules	École normale supérieure, Paris	Vol. 3 – Higher education
Tripard, Léon	École nationale professionnelle, Armentières	Vol. 4 – Technical education
Vareil, Auguste	École normale d'instituteurs, Melun	Vol. 1 – Primary education
Vessiot, Ernest	Faculté des Sciences, Lyon	Vol. 3 – Higher education
Vogt, Henri	Faculté des Sciences, Nancy	Vol. 3 – Higher education
Vuibert, Henry	*Journal de mathématiques élémentaires*, Paris	
Weill, Mathieu	Collège Chaptal, Paris	

Source: L'Enseignement mathématique, vol. 12, 1910, p. 131–132*;* Commission internationale de l'enseignement mathématique. Sous-commission française. 1911. *Rapports.* Paris: Hachette

Table 2.2 Supplementary authors of the 1911 reports

Name	Institution	Participation in the 1911 reports
Bazard, Alfred	École d'Arts et Métiers, Angers	Vol. 4 – Technical education
Bricard, Raoul	Conservatoire national des Arts et Métiers, Paris	Vol. 4 – Technical education
d'Ocagne, Maurice	École nationale des Ponts et Chaussées, Paris	Vol. 3 – Higher education
Fontené, Georges	Inspection académique, Paris	Vol. 5 – Girls education
Friedel, Georges	École des Mines, Saint-Étienne	Vol. 3 – Higher education
Garnier, René	École nationale supérieure des Mines, Paris	Vol. 3 – Higher education
Humbert, Georges	École Polytechnique, Paris	Vol. 3 – Higher education
Janet, Armand	– –	Vol. 3 – Higher education
Lamaire, Pierre	École des Hautes Études commerciales, Paris	Vol. 4 – Technical education
Larivière, Élisée	École nationale professionnelle, Vierzon	Vol. 4 – Technical education
Lévy, Albert	Lycée Saint-Louis, Paris	Vol. 2 – Secondary education
Lombard, Frank	École des Roches, Verneuil-sur-Avre	Vol. 2 – Secondary education
Mineur, Paul	École supérieure de commerce, Paris	Vol. 4 – Technical education

Source: Commission internationale de l'enseignement mathématique. Sous-commission française. 1911. *Rapports.* Paris: Hachette a stand in favor of the educational reforms carried out in France at the beginning of the century, both in his capacity as a member of the higher council for public instruction (*Conseil Supérieur de l'Instruction Publique*),[3] and publicly, he had no hesitation in stating in 1908 that, despite the progress that had been made, public education was "still infused […] with the bureaucratic pedantry and pedagogy of the Ancien Régime" (Appel 1908, p. 235).

Carlo Bourlet had also studied at the *École Normale Supérieure* (in the 1885 year group). He had been professor of mechanics at the *Conservatoire National des Arts et Métiers* since 1907. After a thesis on differential equations, Carlo Bourlet had turned to applied mathematics at the close of the nineteenth century.[4] Although he does not seem to have been involved in any international scientific circles before his commitment to the International Commission on Mathematical Instruction, his interest in the circulation of ideas on an international scale was nevertheless demonstrated by his serious involvement in the promotion of Esperanto, which he saw as a "common auxiliary language […] providing an easy, straightforward and simple means of communicating with other countries" (Bourlet 1907). An author not only of elementary mathematical works but also of the article on mathematics in Ferdinand Buisson's *Nouveau Dictionnaire de Pédagogie et d'Instruction Primaire* (1911), he was, alongside Émile Borel, one of the promoters for the reform of the syllabuses for mathematics in secondary schools in 1902–1905. He shared with Laisant the idea that the teaching of mathematics ought to be of social value and was a fervent defender of the interpenetration of pure and applied mathematics at the International Commission on Mathematical Instruction (Bourlet 1910).

Charles-Ange Laisant, for his part, had been a member of the 1859 year group at the *École Polytechnique* and an examiner for admission to the school. He was a very successful writer of textbooks and books of recreational mathematics. Politically, he was close to the libertarian movement and was much involved in the movements to reform education. He was also a fervent promoter of international cooperation, which he saw as a means of making science progress. His ambition was reflected in the creation in 1894, together with Émile Lemoine, of the journal *L'Intermédiaire des Mathématiciens*, in his involvement in the setting up of the first international congresses and – like Bourlet – in his commitment to Esperanto. Given these circumstances, it is hardly surprising that Laisant placed his experience and the many networks he created during his career at the service of the journal *L'Enseignement Mathématique*, which was created in 1899 and subsequently became the organ of the International Commission on Mathematical Instruction (Coray et al. 2002; Auvinet 2013).

Albert de Saint-Germain, on the other hand, is much less well known to historians (Brasseur 2011). Severe myopia had prevented him from entering the *École Normale Supérieure*, and he did not gain access to university teaching until 1872, 10 years after defending his thesis. At the time of his appointment as Chairman of

[3] See Archives nationales, F/17/13642, Conseil supérieur de l'instruction publique, session de juillet 1905, 7e séance, 22 juillet 1905.

[4] In particular, Bourlet is famous for having written a theory of the bicycle.

the SCF, he had just retired from the Faculty of Sciences in Caen, where he had been professor of rational and applied mechanics for 30 years and had also served as dean. Unlike the other members of the bureau, local provincial grounding was the main feature of Saint-Germain's career. Although he was a member of the SMF for only 5 years (1873–1878), he nevertheless took an active part in the work of the *Académie des Sciences, Arts et Belles Lettres de Caen* from the time he arrived until his retirement and published a large part of his research there. The obituaries for Saint-Germain do not mention any particular involvement in educational reform circles, but his publications indicate a degree of interest in mathematical issues connected with teaching.[5] While Saint-Germain may be considered a more surprising choice for the head of the SCF than Bourlet, Laisant, and Appell, his position reflects the quest for real expertise in the practices and realities of university teaching in France, beyond merely the major institutions in Paris, and the desire to emphasize its "applications." According to the obituary published in *L'Enseignement Mathématique*, Albert de Saint-Germain was also "one of the most active and most useful artisans" of the progress made in the reports that the SCF was to compile for the Cambridge congress, having no hesitation in reminding contributors of impending deadlines so that the reports on France would be submitted on time (Bioche 1914a) (Fig. 2.1).

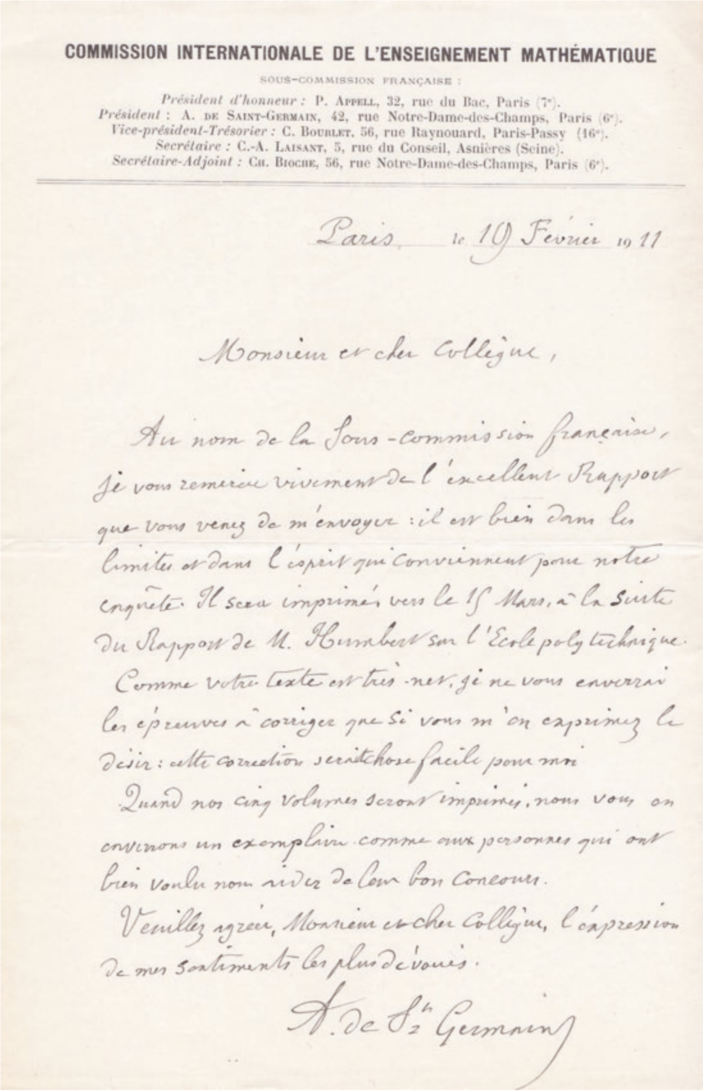
In 1913, the death of Bourlet followed by the resignations of Laisant and Saint-Germain "for age and health reasons" led to a total renewal of the French Delegation to the International Commission on Mathematical Instruction and hence to the bureau of the SCF. The three were replaced by Jacques Hadamard, Maurice d'Ocagne, and Charles Bioche. Hadamard taught at both the *Collège de France* and the *École Polytechnique*. He was also a member of the *Académie des Sciences* and seriously involved in a number of international institutions. Maurice d'Ocagne had just been appointed professor of geometry at the *École Polytechnique*. Charles Bioche taught at the Lycée Louis-le-Grand in Paris and since 1909 had served as Assistant Secretary to the Subcommission, a point we shall return to later.

The profiles of the other members of the SCF and contributors to the 1911 reports, like those of its leaders, reflect a certain desire to open up to include a greater number of mathematicians. In particular, every effort was made to reflect the true diversity of the teaching of mathematics in France, which was far from being limited to a small elite in Paris.[6]

It is true that a greater number of the members held positions in higher education. The most prestigious Parisian institutions – the *École Polytechnique*, the *École Normale Supérieure*, and the Sorbonne – were substantially represented. The massive presence of members of the SMF (a total of 20 members and contributors to the 1911 reports) is witness to the importance within the SCF of a "mathematical

[5] Saint-Germain published some 29 papers in the *Nouvelles Annales de Mathématiques*, a journal aimed at teachers and students. Several of these papers were comments on problems of mechanics students had to answer for the *agrégation* competitive exam. Saint-Germain was also the author of the exercise book (Saint-Germain 1877).

[6] However, no member of the SCF worked in the French colonies.



COMMISSION INTERNATIONALE DE L'ENSEIGNEMENT MATHÉMATIQUE

SOUS-COMMISSION FRANÇAISE :

Président d'honneur : P. Appell, 32, rue du Bac, Paris (7e).
Président : A. de Saint-Germain, 42, rue Notre-Dame-des-Champs, Paris (6e).
Vice-président-Trésorier : C. Bourlet, 56, rue Raynouard, Paris-Passy (16e).
Secrétaire : C.-A. Laisant, 5, rue du Conseil, Asnières (Seine).
Secrétaire-Adjoint : Ch. Bioche, 56, rue Notre-Dame-des-Champs, Paris (6e).

Paris, le 19 Février 1911

Monsieur et cher Collègue,

Au nom de la Sous-commission française, je vous remercie vivement de l'excellent Rapport que vous venez de m'envoyer : il est bien dans les limites et dans l'esprit qui conviennent pour notre enquête. Il sera imprimé vers le 15 Mars, à la suite du Rapport de M. Humbert sur l'Ecole polytechnique.

Comme votre texte est très net, je ne vous enverrai les épreuves à corriger que si vous m'en exprimez le désir : cette correction serait chose facile pour moi.

Quand nos cinq volumes seront imprimés, nous vous en enverrons un exemplaire comme aux personnes qui ont bien voulu nous aider de leur bon concours.

Veuillez agréer, Monsieur et cher Collègue, l'expression de mes sentiments les plus dévoués.

A. de St Germain

Fig. 2.1 Letter from Albert de Saint-Germain to Maurice d'Ocagne, February 19, 1911

France" that had studied at these prestigious institutions (Gispert 1991). It may also be noted that more than half the members and contributors had passed the highly selective *agrégation* competitive examination in mathematics, which marked them as members of the teaching elite. Representatives of higher education were not only from Paris; there were also a number of members from provincial faculties (Lyon, Nancy and Caen). Similarly, substantial space was given over to representatives of higher technical education, which provided a total of nine members and contributors.

In the same way, secondary education was mainly represented by teachers at the more prestigious Parisian secondary schools for boys in Paris (Lycée Louis-le-Grand, Lycée Saint-Louis, Lycée Henri-IV, Lycée Charlemagne) rather than by their counterparts in the provinces. The members of the SCF also included two female teachers working in secondary schools for girls, one in Paris and the other in Bordeaux, and two representatives from the "*École des Roches*," a private secondary institution which had been founded recently (1899) in order to train future members of the elite (Duval 2009). The *École des Roches* was in fact the only private institution featured in the report, and it used active teaching methods. Furthermore, all the members and contributors working in public secondary education belonged to the newly created APMESP. Although many of them were working in Paris, they were thus also members of a national structure with local sections throughout France (Barbazo 2010, p. 14–16), which was meant to provide a forum for all teachers at the secondary level, in the provinces as well as in Paris.[7]

Technical education, further from the usual "center of gravity" of mathematics as a subject but in closer contact with its applications, also occupied an important place within the SCF. Apart from the nine representatives of higher technical education, there were seven other members and contributors from "middle" technical education and two of whom were female teachers working in technical schools for girls. Lastly, within this diversified image of the teaching of mathematics in France, it was probably (and paradoxically, given the number of pupils involved) primary education that remained the least represented, with just four representatives on the SCF. Two worked in primary teacher training colleges, while the other two taught at the *École Turgot* in Paris, which at the time was a benchmark for higher primary schools. It should also be noted that membership to the SCF was not restricted to the teachers of mathematics. It also included four chief inspectors of schools and, perhaps more surprisingly, one editor specializing in the educational and scientific field: Henry Vuibert.

Indeed, the world of publishing appears to be an important feature of the landscape of the teaching of mathematics as portrayed by the SCF. For some of its members, involvement in a journal demonstrated a desire to have ideas circulated beyond national frontiers. Apart from Laisant, who as we have seen was in charge of *L'Enseignement Mathématique*, the members and contributors included 9 of the founders or editors and 13 authors of the *Revue de l'Enseignement des Sciences*. This journal was created in 1907 (and continued to exist until 1920) in order to "serve the general interests of the teaching of the sciences by working for its development" and to promote "the collaboration of ideas and communication of results" in the context of the implementation of the 1902 reform. But its purpose was also to "inform readers of the movement in the teaching of sciences in other countries" (La Revue 1907). Through their involvement in the SCF, the network's members

[7] For instance, Émile Blutel and Charles Bioche were in fact very active members of the association (Barbazo 2010, p. 17).

therefore gave themselves the means of encouraging the international reforming dynamic that their journal sought.

Many SCF members and contributors also demonstrated their interest in matters concerning teaching by producing resources for teachers and learners. Many, for example, wrote for or were otherwise involved in mathematical journals directed at these groups, including *Les Nouvelles Annales de Mathématiques*, the *Journal de Mathématiques Spéciales*, the *Revue de Mathématiques Spéciales*, and the *Bulletin de Mathématiques Élémentaires*.[8] The great majority of them had also written or co-written books intended for teaching purposes – either textbooks or collections of exercises. Even though the practice of publishing one's course was frequent at the time, it was still overrepresented here – a further sign of particular interest in teaching matters on the part of this group of people.

1.2 The 1911 Reports: The Primacy of Professional Experience

By their extensiveness, the series of reports prepared for the Cambridge congress in 1912 constituted the main work of the SCF, although the five volumes – totalling slightly more than 650 pages and published by Hachette in 1911 – took no more than a few years to compile. Each volume, following a pre-defined plan, was devoted to one of the sectors of teaching of the education system in France (CIEM-SCF 1911a, b, c, d, e).

Thus the first volume is devoted to primary education. It begins with a general table of "all the institutions in which mathematics is taught in France," which in a way constitutes an introduction to all the volumes in the series. This is followed by reports devoted to the different levels of primary education (elementary and higher primary schools, teacher training colleges) and an article on the (male) higher teacher training college (*École Normale Supérieure d'Enseignement Primaire*) in Saint-Cloud.

The second volume deals with secondary education. It begins with two general reports that illustrate the two aspects of secondary education in France: one on secondary education "strictly speaking," i.e., up to the baccalaureate examination and the other on the post-baccalaureate preparatory classes (*classes préparatoires*) preparing students for the prestigious State-run *grandes écoles*. The next five reports provide a different type of information, since each covers a specific branch of mathematics: arithmetic, algebra, geometry, mechanics, and cosmography. The volume closes with a report on mathematics at the *École des Roches*. It may be supposed that the inclusion of this report (the only one to be devoted to a private institution) was due to the innovative nature of the teaching methods there, in keeping with the method of teaching mathematics that the SCF wished to defend – actually, the

[8] Some of them, such as Raoul Bricard and George Fontené, dedicated a large part of their professional activity to writing papers in these kinds of journals.

author of this report indicates that Carlo Bourlet had inspected the school some years earlier and found its methods interesting.

The third volume, on higher education, was in fact the first to be published. It begins with two reports on the subjects taught in faculties of sciences. The remainder of the volume takes more the form of a catalogue of the main institutions of higher education (including the prestigious State-run *grandes écoles*), each with its own specific particularities, rather than an overview of higher education in France highlighting the common features of the various institutions.

The fourth volume is devoted to the teaching of mathematics in the various technical (industrial and commercial) schools dependent on the Ministry of Trade. It deals in turn with the middle technical schools (*écoles pratiques de commerce et d'industrie*, *écoles nationales professionnelles*), the *écoles nationales d'Arts et Métiers* and the commercial schools, and lastly the *Conservatoire National des Arts et Métiers* and the *École Centrale des Arts et Manufactures*.

The fifth and final volume is devoted to teaching for girls. This volume, unlike the other four, covers all levels of teaching, which is an indication of the status of girls' education in the French system at the time. It indicates a number of points of intersection with teaching for boys. For example, it refers to the first volume for two of the reports on primary education and mentions a number of the authors from the first volume. However, this fifth volume also documents the difference between the teaching of girls and the teaching of boys. For example, the report on mathematics in vocational education for girls is included in this volume rather than in the volume on technical education, and, whereas the report on the higher teacher training college in Saint-Cloud is included in the first volume, the report on its counterpart for female students, in Fontenay-aux-Roses, is included in this fifth volume.

The volumes published in 1911 differed from the project as initially announced on a number of points, although there was no change to the basic structure. One of the changes was that Charles Bioche became one of the most important figureheads in the undertaking. The original plan had been for the chief inspector of primary education Jules Lefebvre to direct the volume on primary education, but in the end, for reasons that were not explained, he appeared merely as one of the authors of the volume when it was published, under the guidance of Bioche.[9] Similarly, the volume on secondary education was originally planned to be directed by Francisque Marotte, who taught at the Lycée Charlemagne. Marotte was probably selected for his "international" expertise – in 1904 he had given a lecture on science teaching in German secondary schools, as part of the lectures organized that year at the *Musée*

[9] We also want to notice that a report on the Collège Chaptal was planned for the first volume. (Chaptal was a Parisian higher primary school whose specificity was to give a lot of room to science. The school had among its classes some preparatory classes to the Grandes Écoles.) A manuscript had already been written in 1911 by Mathieu Weill, a former pupil of the École polytechnique who later became a teacher of mathematics and was at the time the director of this *collège*. It was finally replaced by a report on the École normale supérieure of Saint-Cloud (see *L'Enseignement mathématique* vol. 13, 1911, p. 128). Similarly, a report by Athanase Gilles (a chief inspector for primary schools who regularly contributed to the *Revue pédagogique*) went unpublished (CIEM 1910, p. 131).

Pédagogique to accompany the 1902 reform (Gispert, Hulin and Robic 2007). As he had to abandon his duties for health reasons, it was in the end Bioche who directed the volume on secondary education.

Generally, the SCF gave preference to contributors who had a good knowledge of the subject they were to cover; most were probably selected for their professional experience. The first three reports on primary education, for example, were written by Jules Lefebvre, who in 1908 had just been appointed chief inspector; Gustave Tallent, who taught at the Turgot higher primary school in Paris; and Auguste Vareil, a teacher at the primary teacher training college in Melun. Similarly, in the volume on higher education, each report covering one particular institution was written by one author, who was responsible for teaching mathematics at that institution (with the exception of the report on the *Collège de France*).[10] While their careers did not indicate any particular interest in matters concerning teaching as such (with the notable exception of Émile Borel and Jules Tannery),[11] all, by virtue of the positions they held and/or the responsibilities they exercised, proved able to present the recent developments, the challenges, and even the problems raised by the reforms in higher education initiated in France since the end of the nineteenth century. To name but a few, we may point out that Henri Vogt, who compiled the report on the technical institutes within faculties of sciences, had been one of the initiators of the *Institut Électrotechnique* in Nancy, of which he was director at the time (Birck and Grelon 2006, p. 240). Similarly, Albert de Saint-Germain, who had been a member of the Faculty in Caen for 30 years and dean for almost 20, was able to draw on his experience when reporting on the introduction in 1896 of the "general mathematics certificate" (*certificat de mathématiques générales*) for those students who had not attended a secondary school (Nabonnand 2006).

The SCF was also able to call upon a number of authors with more specific skills in addition to their professional experience. For the volume on secondary education, for example, Bioche, author of the first report, and Émile Blutel, author of the report on preparatory classes, were not only teachers in the classes concerned but also were both involved in the APMESP and consequently probably well informed of the realities of secondary education in the provinces. In the same volume, it may also be supposed that the authors of the five reports on the various branches of mathematics had been called upon because of their previous publications. Not only did all have proven experience in secondary education, but all had also written articles or

[10] It was the case for Tannery (École Normale Supérieure), Humbert (École Polytechnique), d'Ocagne (École nationale des Ponts et Chaussées), Garnier (École nationale supérieure des Mines), Friedel (École nationale des Mines de Saint-Étienne), and Janet (École d'application du Génie maritime). In the same way, the book on technical education (CIEM-SCF 1911d) was directed by Paul Rollet, director of the École Diderot in Paris and all the authors of (CIEM-SCF 1911d) worked in the teaching institution they wrote a report about – including Appell, who wrote the report on the École Centrale.

[11] Actually, the issue of teaching methods was not explicitly mentioned in CIEM-SCF (1911c), which is due to the fact that pedagogy was not considered as important in higher education at the time.

textbooks on the subject they covered.[12] No doubt their teaching skills had not escaped the members of the bureau of the SCF: three of them (Lévy, Rousseau, Béghin) had in fact been singled out by their superiors as being excellent teachers, and another (Guitton) had written an algebra course in the collection of textbooks directed by Carlo Bourlet.[13] Similarly, direction of the volume on education for girls was entrusted to Anna Amieux, at the time a teacher at the Lycée Victor-Hugo in Paris. She had been a student at the secondary teacher training college in Sèvres, had passed the *agrégation* competitive examination in science, and was a member of the APMESP; she had been awarded an "*Autour du Monde*" scholarship by the Albert Kahn Foundation in 1905, which had enabled her to visit the United States. Anna Amieux was in favor of better access for girls to higher education, particularly in the sciences (Serginette 1911), and defended positions that could be qualified as feminist (Amieux 1908).

In the end, the five volumes of reports had the advantage of a team of contributors selected for their excellent knowledge of the field and of the realities of the teaching they were asked to describe – indeed this matching of the skills of the author to the contribution required probably contributed to the speedy conclusion of the enterprise. Not all the contributors, however, provided merely a description. We shall see (in the second part) that by placing emphasis on recent developments, and even more by expressing a point of view on such developments as they deemed desirable, they were in fact pleading in favor of a resolutely modern vision of the teaching of mathematics.

1.3 Circulate, Communicate, Inform

Thanks to a number of its members, the work of the International Commission on Mathematical Instruction and, to a lesser extent, the work of the SCF were circulated in France in mathematical circles by other channels in addition to the journal *L'Enseignement Mathématique*, the Commission's official organ. Some publications revealed the difficulties encountered. In 1909, for example, at the 38th congress of the AFAS, held in Lille, Charles Laisant stressed the importance of making a start on compiling the SCF reports without delay, given the promptness of the other countries involved, particularly Germany and the United States (Laisant 1910; Anonymous 1909a). He also stressed the necessity of serious involvement in the undertaking on the part of the French Government. Actually, although the Government had given the Subcommission a grant of 800 francs, it had not ratified

[12] Apart from Lévy, all of them had already been nominated to the SCF in 1910, but the names of the authors of the reports are not mentioned in CIEM (1910, p. 131). Among the books and papers written by these authors, see: Lévy 1909–1910a, 1909–1910b; Rousseau 1909; Béghin 1903; Béghin and Rousseau 1903; Fort and Muxart 1910; Guitton 1909; Guitton 1913.

[13] On Lévy and Rousseau, see Brasseur (2018a, b). On Béghin, see Charle and Telkès (1989). One has also to notice that Rousseau promoted Esperanto.

the names of the French delegates to the Central Committee of ICMI: “As a result, the Delegation and the French Subcommission, with no official consecration, run the risk of finding themselves in a position of moral and material inferiority compared with the other countries if the situation were to continue. […] Such inferiority would be far from corresponding to the actual truth,” Laisant explained (Laisant 1910, p. 31).[14] He believed that it was the State’s involvement, including from the material point of view (Laisant hoped the grant would be renewed in 1910 and 1911), that would give a good image of France on the international scene at this “sort of universal exposition of mathematical instruction” that the Congress in Cambridge was meant to constitute (Laisant 1910, p. 32).

A number of journals and newsletters of associations of scientists and mathematicians also reported on the creation and activities of the International Commission on Mathematical Instruction and the SCF. One example was the *Revue de l’Enseignement des Sciences*, which also showed its interest in international matters by publishing in 1908 an article by Walther Lietzmann (who was Secretary to the German Subcommission) on “the reform movement in the teaching of mathematics in Germany” (Lietzmann 1908).[15] Early in 1909 it reproduced, albeit with no commentary, the preliminary report which ICMI had produced in October 1908, in the form in which it had been published in *L’Enseignement Mathématique* (Anonymous 1909b). However, a comprehensive search through the different French scientific and mathematical journals would be necessary to reach a better assessment of the editorial dynamics of the reporting and discussing of the work of the International Commission on Mathematical Instruction and the SCF. Examination of a small number of these journals would appear to indicate that it was not until 1911 – the year the SCF reports were published – that circulation became more sustained, thanks to the efforts of certain members of the SCF. Thereafter, the *Bulletin de la Société Mathématique de France* (Bioche 1911; Vessiot 1914), the *Bulletin de l’Association des Professeurs de Mathématiques de l’Enseignement Secondaire Public*, and the *Revue Générale des Sciences Pures et Appliquées* (Saint-Germain 1911; Bioche 1914b)[16] published articles and meeting reports about the International Commission on Mathematical Instruction and the SCF, albeit very sporadically – publication often coincided with meetings or congresses (Milan in 1911, Cambridge in 1912, Paris in 1914). On the other hand, it appears that neither *Les Nouvelles Annales de Mathématiques*, despite its interest in educational matters, nor the

[14] The governments of the countries which participated in the Commission were invited to “put at the disposal of their delegation an amount of money that would totally cover the expenses of the delegation and of the national subcommission and contribute to the general expanses of the Commission” (CIEM 1908, p. 449).

[15] This paper was translated from German by Paul Mineur, teacher at the Collège Rollin in Paris, who was also one of the auteurs of the volume on technical education (CIEM-SCF 1911d).

[16] After this paper by Bioche, the journal published a conference given by Maurice d’Ocagne for the opening session of the Congress of Paris, the 2nd of June 1914, as well as the general report on “The mathematical training of engineers in the different countries” read the day after by Paul Staeckel, professor at the university of Heidelberg.

Journal de Mathématiques Pures et Appliquées paid much attention to such articles.

Thus, it was in June 1911 that the Chairman of the SCF, Albert de Saint-Germain, published in the *Revue Générale des Sciences Pures et Appliquées* a notice presenting the activity of ICMI since its creation and the five volumes produced by the Subcommission (Saint-Germain 1911). This gave him an opportunity to reiterate Laisant's comments made in 1909 regarding the difficulties encountered by the French Delegation in obtaining official recognition from the State and reasonable financial support. Whereas the Hungarian Delegation had received the equivalent of 6300 francs, its French counterpart had received no more than 4800 francs, in quarterly instalments, from the Ministry of Public Instruction. Four annual payments of 1000 francs were eventually added from the Ministry of Trade, which was responsible for technical education. Saint-Germain also recalled that the publication of the SCF reports had only been possible "thanks to the liberal conditions" allowed by the publisher, Hachette (Saint-Germain 1911, p. 474).

Among the people involved in circulating the work of the International Commission on Mathematical Instruction and the SCF, particular mention should be made of Charles Bioche (1859–1949). In addition to reporting to the SMF (of which he was President in 1909) on the Milan meeting in 1911 (Bioche 1911), he also took it upon himself to make the work of ICMI known among secondary school teachers, via the APMESP of which he was an active member (and indeed its President in the first half of the 1920s). Starting in 1912, articles on ICMI and on the teaching of mathematics in other countries – several of which were penned by Bioche – were published in the association's *Bulletin*. This gave him an opportunity to demonstrate the influence that the French method of teaching mathematics exerted in other countries:

> I believe it is my duty to make one comment from the outset. From what I have heard at both Milan and Cambridge, from my colleagues in other countries, it would appear that they have a keen interest in what is happening in France, and that they hold our teaching of mathematics in high esteem. […] We may criticize our methods and our syllabuses, but it is good to note that after all, despite its imperfections – which we are the first to point out – our teaching is of acknowledged value, and that foreigners continue to look to us for inspiration. (quoted in Barbazo 2010, p. 31).

2 "Modern" Mathematics and Teaching Methods "For All"

At first sight, the SCF reports were mainly of an informative nature. Much space was given over to reproducing syllabuses and describing the functioning of the different institutions in the French education system. The reports, for example, detailed the recruitment methods, the number of hours spent on mathematics classes, and their breakdown. Nevertheless, despite the neutral tone adopted, many of them allow a glimpse of what may be qualified as the commitment of the teaching, from the political point of view as well as from the mathematical and educational point of view.

2.1 A Politically Committed, Militant Subcommission

It is characteristic of the SCF reports that they supplied a relatively uniform view of mathematics in schools and the way it was taught, whatever the level or sectors of education (primary, secondary, technical, higher; boys, girls) was. This point should be emphasized, since in the early twentieth century the French school system was still highly segmented vertically, i.e., subdivided "into parallel schools and programs distinguished both by their curricula and the social origins of their students" (Ringer 2003, p. 6). Nor were the purposes of the different sectors of the education system the same in France at that time. It may be thought that the very project of ICMI to consider "the overall field of mathematical instruction, from the initial introduction to the subject up to higher education" (CIEM 1908, p. 451–452), including technical and vocational schools, influenced this general conception of the teaching of mathematics in France that the SCF illustrated – and sought to promote – despite the "variety of the types of curricula and methods" referred to by Charles Bioche (CIEM-SCF 1911a, p. 1–8) and the varied sensitivities of the contributors of the various reports.

In fact, one of the important points raised by the 1911 reports was the adaptation, or even the contribution, of the teaching of mathematics to the democratization of teaching. A first trace of this aspect remains, as we have noted, in the very organization of the reports. By paying particular attention not only to primary education but also and above all to technical education and to education for girls, the SCF could not fail to point to the matter of the possibility of access to mathematics (and to the sciences more generally) for *all* sectors of the population. Thus the reports on middle technical schools stressed that technical education should also contribute to the training of the mind. They explained that although this type of education was primarily utilitarian, it "[did] not become truly effective unless it relies on a foundation consisting of a certain amount of general knowledge" (CIEM-SCF 1911d, p. 36) or recalled that it was a matter of "developing the mind at the same time providing a trade" and that the aim was thus to "train practical men of receptive intelligence" (CIEM-SCF 1911d, p. 92).

The same may be said of the reports compiled by Anna Amieux and Henriette Baudeuf on secondary education for girls. Amieux's report emphasized the need to adapt secondary schools for girls for the "movement for the emancipation of women" and more particularly to raise the level of mathematical studies at the time. Henriette Baudeuf – a teacher at the *lycée* for girls in Bordeaux[17] – expressed a similar opinion: she placed particular emphasis on the fact that the "experience" of recent decades had shown that "many girls both enjoy and understand mathematics," contradicting "the current and generally accepted prejudices […] which assert that girls have well-developed sentimentality but a weak intellect" (CIEM-SCF 1911e, p. 29). It was therefore also the idea of a certain unity in the training received

[17] Henriette Baudeuf also held a qualification from the secondary teacher training college in Sèvres and the *agrégation* qualification (and a doctorate in sciences).

by the French population, both boys and girls, that Henriette Baudeuf defended on behalf of the SCF as a whole.[18] Basically, the SCF was supporting no less than the introduction of a culture of mathematics that was common to all sectors and to all pupils.

This same theme of democratic access to the study of mathematics was also evident in higher education, with regard to academic degrees in mathematics. One of the reports, for example, advocated that the general mathematics certificate scheme should be allocated more resources, in order to provide a better response to the needs of the "new students" (CIEM-SCF 1911c, p. 19) arriving not from the secondary schools but from the industrial or higher primary schools and for whom the certificate had been created. Regarding scholarship students, the report even warned against the administration "too often fostering precipitation [in students' studies] by being over-parsimonious with the amount of the allowances and over-strict in its regulations" (CIEM-SCF 1911c, p. 25).

A second theme that recurs in the work of the SCF was the defense of the reforms that had been introduced recently in France, just at the time that voices were beginning to be raised to contest them (Jey 2000). The 1902 reform in secondary education in France de facto placed scientific culture in competition with the classical culture (based on the study of Ancient Greek and Latin) which had been predominant until then. This reform met with considerable opposition when it was introduced. Its detractors criticized it for its utilitarianism (cf. *infra*), which they felt separated secondary education from its main purpose of training the mind and inculcating culture for its own sake – but which meant in practice that education was reserved for an elite (Héry 2016). Yet, in the end, there was very little mention in the SCF reports of these discussions, criticisms, and problems raised by the reform and its implementation.

Bioche's report on secondary education offers a striking example of this. Bioche did indeed point out that the 1902 reform had been initiated by university academics "who had no practical experience of secondary education." It had been revised in 1905 to take account of some of the objections raised by the teaching body (CIEM-SCF 1911b, p. 9). However, Bioche took care to report the remarks made by the partisans of general culture combining humanities and sciences – among teachers of grammar as much as among teachers at the *École Polytechnique* – and did not mention anyone who was opposed to this point of view (CIEM-SCF 1911b, p. 12). There were also many indications of support for the recent reforms in the comparisons between the old and new curricula – one of the main features of the modernization was that emphasis was placed on the scientific approach and on the thought process rather than learning by rote, which placed more emphasis on memory. We

[18] Three male authors also contributed to the volume. Paul Appell, who wrote the report on the *École Normale Supérieure* of Sèvres (where he taught), only described the syllabus. In contrast, Georges Fontené, inspector of the Academy of Paris, and Gabriel Kœnigs, professor at the faculty of Science of Paris, stressed in their report on the *École Normale Supérieure* for female teachers of Fontenay-aux-Roses, first, the ability of girls to understand high-level scientific classes and, second, the necessity of such classes in their training. On the question of secondary education for girls, see Hulin (2011, p. 123-134).

see an example of this in Blutel's report on the preparatory classes. Under the old syllabus for analytical geometry, Blutel explained, students were required to deal with many problems of an "artificial" nature and found themselves "out of their depth" and "forgetting to coordinate their results" (CIEM-SCF 1911b, p. 24). On the contrary, the new syllabus allowed "fruitful rapprochements" (CIEM-SCF 1911b, p. 26), so that "although students are less versed in the details, [...] they are more accustomed to thinking, comparing and generalizing » (CIEM-SCF 1911b, p. 30). The question of applications and connection with real life, which was an important feature of the reform, was in fact also defended vigorously, as we shall see later.

The 1902 reform also aimed to bring about a thorough renovation of teaching methods, for example, by stressing practical exercises in the sciences, by not allowing teachers to dictate lessons word for word, and by advocating for not using the pupils' own mother tongue during modern language classes. By these aspects, the reform promoted some of the educational principles that were already being implemented in primary education but were still largely disregarded in secondary education. For the opponents of the reform, this insistence on teaching methods was not only irrelevant: it also curbed the freedom teachers enjoyed. Moreover, at the time the SCF was compiling its reports, the change in teaching practices that was the core feature of the spirit of the 1902 reform, particularly by the emphasis it placed on a real life and experimental approach to mathematics, was still only partial; the use of such methods in mathematics was far from being the norm, and, above all, it was far from being accepted in practice (Héry 2016).

Yet it was specifically – and this is the third theme taken up by the SCF – the manner in which mathematics was being taught that was the truly central aspect of the set of five volumes of reports as a whole. Questions on the order to adopt, the method to be used in class, and placing the pupils in a learning situation recurred in many of the reports, including in some of those on secondary and higher education, where the question of teaching method was not necessarily of paramount importance in practice. Indeed the general point of view was, as expressed by Jules Lefebvre with regard to primary education, that pupils' good results were "due to the method and the teaching process" (CIEM-SCF 1911a, p. 15). Yet, as Jules Tannery wrote in his report on the *École Normale Supérieure* (where the acquisition of theoretical knowledge and the learning of mathematical research nevertheless played a major role), "the job of a teacher, like any other job, has to be learned" (CIEM-SCF 1911c, p. 77). The reports were thus careful to show that the implementation of an effective teaching method depended in fact on professional competence and relied on a certain number of approaches and techniques, far from depending on the charisma or personality of the teacher.

Thus, the importance of making pupils "experiment" appears recurrently, with regard not only to teaching young children the notion of numbers (CIEM-SCF 1911e, p. 13) but also to the teaching of geometry in connection with craft work in the higher primary schools (CIEM-SCF 1911a, p. 24–25) and solid geometry in secondary schools (CIEM-SCF 1911b, p. 110–111). The theme also recurred when Ernest Vessiot, professor at the Faculty of Sciences in Lyon, advocated the "creation of laboratories" (CIEM-SCF 1911c, p. 25) in respect to the general mathematics certificate, taking up an idea developed some years earlier by Émile Borel (albeit only with regard to secondary education) in his 1904 lecture at the *Musée Pédagogique* aimed at defending the outlines of the 1902 reform (Borel 1904).

More generally, the reports stressed the fact that the active participation of pupils, on the condition that they were guided by the teacher, promoted understanding and assimilation, at all levels of teaching. Thus, mental arithmetic, carried out in elementary primary schools "by questioning the class collectively and obtaining either individual oral replies or a collective written reply using the La Martinière process [i.e., using a slate]," became a "means of intuitive reasoning" that produced "remarkable" results (CIEM-SCF 1911a, p. 15). It was also possible to read in the reports that, to make sure that the lessons of the previous day had indeed been understood, it was better that the teacher of the *mathématiques spéciales* class (a preparatory class) should ask the students questions rather than make them "recite" the lesson and also teach in an oral fashion, since note-taking, for pupils who were already advanced, "maintains [their] attention, exercises [their] judgment, and results in a felicitous start to assimilation" (CIEM-SCF 1911b, p. 28–31). For his part, Vessiot recalled that university courses in differential and integral calculus were supplemented by lectures, during which "problems are dealt with […] at the blackboard [by the students], under the guidance of the professor or a lecturer" (CIEM-SCF 1911c, p. 10).

Taking the role of interaction between teacher and pupil in the learning process into consideration also had the effect of promoting an innovative manner of teaching, since it was a far cry from the lecturing style of teaching that had long been the preferred method and was still particularly widespread (Bruter 2008). Admittedly some authors recalled the educational freedom teachers had and the diversity of possibly effective methods (CIEM-SCF 1911b, p. 88; CIEM-SCF 1911d, p. 38–39). But the advantages of "the Socratic method," perhaps combined with the usual method, were put forward, including for girls (CIEM-SCF 1911e, p. 10 and p. 32), for classes in technical education (CIEM-SCF 1911d, p. 43), and even for preparatory classes (CIEM-SCF 1911b, p. 88–90).

Defending the 1902 reform and a democratic view of the teaching of mathematics also meant that the SCF promoted in its reports a type of mathematics that suited its conceptions: the type of mathematics that was advocated was intended to be both more useful and more "modern."

2.2 Useful Mathematics?

Although little explanation was given of this aspect, adaptation to the developments of the modern world – a world which was henceforth heavily industrialized and was going to be increasingly so – was a challenge that structured the mathematics taught in schools in the fashion advocated by the SCF. The fact that technical schools were included, at both the middle and higher levels, is a good indicator of this trend. Not only was one entire volume – and the thickest, at that – devoted to them, but the teaching of mathematics in technical and vocational schools was also mentioned in the volumes on primary education, education for girls, and higher education (the *Écoles des Mines* in Paris and Saint-Étienne, the *École des Ponts et Chaussées*, and technical institutes within faculties of sciences). Secondary education, with its traditionally "disinterested" nature that focused more on literary studies, was more particularly concerned by this state of mind. Seeking to highlight "the place and importance of mathematics" in secondary education in France, Charles Bioche recalled that by increasing the proportionate places science and modern languages occupied in the curriculum, the 1902 reform had aimed at "placing pupils leaving the *lycée* in a position to understand the many industrial applications they would encounter from the start of their careers and not remain foreign to the economic movement which was increasing in importance daily" (CIEM-SCF 1911b, p. 10).

Thus, the SCF seemed to be in phase with the state of mind prevalent at the international level at the time, as evidenced not only by some of the topics that were being studied, including the role of mathematics in the engineering sciences and in higher technical education (Paris 1914), but also by the modernist and/or industrialist addresses to be heard at meetings of the International Commission on Mathematical Instruction (Nabonnand 2007). "The development of modern technology and social life constantly leads to new problems that call for the collaboration of mathematics," said Félix Klein at the meeting in Milan in 1911 (CIEM 1911, p. 498). The lectures given at these meetings by two eminent members of the SCF, Carlo Bourlet (Brussels, 1910) and Émile Borel (Paris, 1914), were in the same vein. Carlo Bourlet thought that industry "reigns supreme over the world" felt it was necessary to develop the scientific disciplines "from which this industry draws its strength." He consequently recommended that secondary school mathematics teachers should remove from their teaching "everything that will not be more or less directly of use in the applications" (Bourlet 1910, p. 376)). In a similar fashion, Émile Borel emphasized the gap between the scholastic culture of secondary education and the realities of everyday life, as "industrial applications [were] increasingly becoming an integral part of our existence" (Borel 1914, p. 201–202).

Hence the insistence in the SCF reports on practical applications and "useful notions." This insistence should not come as a surprise in respect to the primary schools, where "teaching is aimed at usefulness" (CIEM-SCF 1911a, p. 10), nor in respect to the technical schools, where mathematics teachers were to point out, "whenever the opportunity arises, […] the immediate, usable applications of the theories being expounded" (CIEM-SCF 1911d, p. 3). Highlighting the practical applications of what was being learned was particularly important in secondary education for boys, which traditionally offered rather theoretical, abstract mathematical studies. Here, the SCF reiterated the conceptions promoted by the 1902 reform and the official instructions issued in 1905, which recommended increasing the number of "practical exercises" and "bringing out the connection between a theory and its applications" (Belhoste 1995, p. 671–677). The positions adopted by the various parties concerned were not completely uniform, however. More than practical utility, it was educational value that was put forward. If Charles Bioche emphasized the "important role that applications – numerical calculations and graphical constructions – should have," it was because he felt they made it possible to make the teaching of theory more fruitful, whether it was by working on orders of magnitude or by seeking "the most economical solution" (CIEM-SCF 1911b, p. 13). His colleague Albert Lévy, a teacher at the Lycée Saint-Louis, acknowledged that it was indeed necessary to react against the "scarcely practical education" of the nineteenth century. Nevertheless he felt that the utility of mathematics should not be restricted to "the mere requirements of practice." It should, on the contrary, retain "a degree of beauty and method and hence be of value in the training of the mind" (CIEM-SCF 1911b, p. 53–55). On the other hand, Ernest Guitton, a teacher at the Lycée Henri-IV who was close to Carlo Bourlet,[19] appeared to be much more radical; he felt that mathematics did not necessarily lose its educational virtues if it was shown to "serve some purpose": "Does it belittle science if we talk of graphs showing temperature or pressure, or graphs involving railways? Can there be any more beautiful example of systems of linear equations than those which are reached by the application of Kirchhoff's Laws to direct electrical currents?" (CIEM-SCF 1911b, p. 72). He therefore felt that applied mathematics had a "necessary place" in secondary education. This is indeed the spirit of the "scientific humanities" promoted by the 1902 reform, but it also shows the differences in interpretation with regard to ultimate purpose.

It was a different – and rather militant – vision of utility that was proposed in the reports on secondary education for girls: taking note of the "evolution in needs" brought about not only by the economic and social transformations of the time but also, as we have seen, by the "movement for women's emancipation" (CIEM-SCF 1911e, p. 8–9). Their authors Anna Amieux and Henriette Baudeuf felt that the teaching of mathematics as provided in secondary schools for girls could no longer be limited to the purpose it had had in the early 1880s, namely, the training of future wives, mothers, and housekeepers. It now needed to meet the growing aspirations of girls to continue their studies in higher education and obtain university diplomas, starting with the baccalaureate – the key that unlocks the door to university studies. These diplomas, Anna Amieux wrote, "offer them security for their futures, and enable them to construct their own independence" (CIEM-SCF 1911e, p. 8–9). Henriette Baudeuf for her part was in favor of teaching mathematics to girls not merely within the limits of imparting general culture but on the contrary in a "more practical and more extensive" fashion (CIEM-SCF 1911e, p. 51), paying more attention to the applications, closer to the way the subject was being taught to boys. It should be noted in this respect that the views they expressed on teaching mathematics at girls' secondary schools were extremely topical in France at the time. Indeed one of the first questions studied by the brand-new APMESP in 1910 was whether girls should be allowed to sit the baccalaureate examination, and, on a proposal from the association, the syllabuses for mathematics at secondary schools for girls were revised accordingly in 1911 (Barbazo 2010; Belhoste 1995).

[19] Ernest Guitton was one of the authors of the *Cours complet de mathématiques* published by Hachette under the supervision of Carlo Bourlet.

2.3 Decompartmentalized Mathematics, Renewed Mathematics

While overall the members of the SCF spoke out in favor of greater utility in mathematics, giving more importance to its applications, they also expressed their ideas on the internal organization of the discipline and its various component subdisciplines, starting with geometry.

Regarding the organization of the discipline, a number of the SCF reports relayed extensively the question, raised by ICMI as early as 1908, of the "links between the various branches of mathematics" (arithmetic, algebra, geometry, etc.) and a possible abolition of the "conventional limits" separating them from each other (CIEM 1908, p. 456). The question was all the more topical since it had fallen to Charles Bioche to give an overall report on "the question of the fusion of the different branches of mathematics in middle education" at the meeting in Milan in 1911 (CIEM 1911, p. 468–471). Bioche referred on the one hand to the "purists" who maintained a strict separation of the different areas of mathematics and on the other to the "fusionists" who, on the contrary, interwove them, for example, by using graphs in arithmetic and algebra or by combining plane geometry and solid geometry as Charles Méray and Giulio Lazzeri did in France and Italy, respectively. It came as no surprise that Bioche broached this matter in the report on secondary education by referring to the change of perspective brought about by the 1902 reform: "The old syllabuses made a very clear separation between the different subjects […]. That is now no longer the case" (CIEM-SCF 1911b, p. 2). This was however a relatively neutral and factual point of view, which contrasted with that of his colleague Guitton. Emphasizing the contributions made by the 1902 reform, Guitton unequivocally denounced the "hermetic partitions" that existed between the different branches of mathematics:

> We do not wish to insist on well-established reasonings based purely on arithmetic or algebra. Such childishness needs to disappear from secondary and primary education. We wish to discuss above all the connections being established between geometry and calculus […]. Geometry cannot dispense with algebraic calculus. (CIEM-SCF 1911b, p. 70)

Whereas the introduction of the notion of function and graphs (and differential calculus more generally) in algebra syllabuses at secondary schools was one of the major innovations in the 1902 reform (Artigue 1996; d'Enfert 2015) and was taken up subsequently in higher primary schools and technical schools, little mention was made of it in the SCF reports. Similarly, the question of the coordination (the "fusion," even) of the teaching of geometry with the teaching of geometrical drawing was barely mentioned,[20] despite the claims of mathematics teachers and lecturers who considered their discipline to be an experimental science and considered geometrical drawing as constituting the practical work of mathematics, on a par with the practical exercises carried out in the physical sciences (Borel 1914, p. 435; d'Enfert 2016).

[20] See however CIEM-SCF (1911a, p. 25) about higher primary schools.

On the other hand, the question of the "fusion" of plane geometry with solid geometry, and more generally the question of the implementation of Charles Méray's conceptions regarding geometry and its teaching, attracted much more attention from the SCF. Méray taught at the Faculty of Sciences in Dijon and worked for the journal *L'Enseignement Mathématique*; in 1874 he wrote a book entitled *Nouveaux Éléments de Géométrie*, in which he undertook to refocus the teaching of geometry on the properties of motions (translations, rotations) and on the simultaneous study of plane and space (Méray 1903). Timely reprints appeared in 1903 and again in 1906 after the book had been "exhumed" by Laisant in 1901 in an article published in *L'Enseignement Mathématique.* In this article, Laisant also reported on the experiments in applying Méray's ideas that had been carried out at the higher primary school in Dijon in the second half of the 1870s (Laisant 1901; Auvinet 2013 p. 485–486). Breaking away from Euclidian logic, Méray proposed an approach that was more experimental, more grounded, and more intuitive, and the official instructions issued in 1905 were partly based on it. In fact, at the start of the twentieth century, the "Méray method" – implementation of which had been resumed in 1898–1899 at a number of schools, including primary teacher training colleges and higher primary schools[21] – was being promoted in scientific and educational circles (Méray 1904; Mironneau 1902; Tannery 1903; Chevallier 1905; Vareil 1907; Laisant 1907; Boudier et al. 1907; Marotte 1907). Indeed, it had a number of convinced partisans within the SCF: Laisant, naturally, but also Jules Tannery, Émile Borel, and Carlo Bourlet – these last two took it as their inspiration for the geometry textbooks they published at this time (Domage 2013) – and two teachers at primary teacher training colleges, Jean-Augustin Chancenotte (Dijon) and Auguste Vareil (Melun), who had incorporated the Méray method in their teaching.

In this context, the SCF reports appear to be a real forum on the pertinence of Méray's proposals, with a variety of viewpoints and different positions being put forward in the various educational sectors. Thus it was an essentially epistemological – and particularly enthusiastic – view of the Méray method that was expressed by Théophile Rousseau, a teacher at the *lycée* in Dijon (the town where Méray worked), in his report on the teaching of geometry at secondary schools (for boys) (CIEM-SCF 1911b, p. 77–118).[22] Rousseau highlighted the effect Méray's book had had, creating a separation between partisans of the new ideas and the "traditionalists" who remained faithful to Euclidian geometry and its organization. He emphasized its influence on recent developments in geometry syllabuses and school textbooks. While teachers seemed to agree on the fact that "the properties of motions must be taken as the foundations of elementary geometry" (CIEM-SCF 1911b, p.110), he felt that there was by no means a consensus on the question of the "fusion" of plane geometry with solid geometry. He therefore made every effort to provide

[21] A partial list is published in CIEM-SCF (1911a, p. 24).

[22] Rousseau had published in 1909 a paper about "elementary geometry based on groups of movements" in *L'Enseignement mathématique*. He showed in that paper that fewer postulates were needed when one used groups of movements than when one used the classical Euclidean way (Rousseau 1909, p. 97).

justification for such a fusion, arguing that “we live in a space, not on a plane” (CIEM-SCF 1911b, p.111) and promoting constructions and manipulations of solids. Other reports, however, demonstrate a degree of circumspection with regard to the Méray method. One such is the report on the *École des Roches*, whose author explained that although the method had been introduced at the school before 1907, much to Bourlet’s satisfaction, it had proved necessary to abandon it in part: “With this type of reasoning – translation, rotation – one can never be certain of a meticulous demonstration” (CIEM-SCF 1911b, p. 143). Similarly, Anna Amieux wondered about the consequences if the Méray method were to be introduced in secondary education for girls: “What do pupils stand to gain by changing axioms and postulates? How do ‘intuitive’ and ‘experimental’ results lead them to general truths? Are demonstrations based on motions really as easy to understand as the advocates of the new methods believe, and as a fruitful in terms of results?” (CIEM-SCF 1911e, p. 25). Conversely, the reports on middle technical schools – which were more pragmatic and also more favorable to combining plane geometry and solid geometry – noted specifically that the Méray method made proofs simpler and more intuitive but was also a way to bring geometry and its applications and the requirements of graphic drawing much closer together (CIEM-SCF 1911d, p. 33–52 and p. 87–98). For his part, August Vareil, one of the experimenters of the Méray method at the primary teacher training college in Melun, appeared to regret the silence in the official instructions regarding teacher training colleges:

> The official instructions make no mention of the new methods that place the notion of movement as the foundation of geometry, even though, since 1901, a certain number of teachers at primary teacher training colleges have adopted Monsieur Méray’s ideas and obtained encouraging results (CIEM-SCF 1911a, p. 66).

This notwithstanding, and beyond the difference in points of view, the Méray method and the discussions to which it gave rise within the SCF nevertheless made it possible to consider what might constitute a culture of mathematics – or in this case geometry – that was not only “modern” but also common to the different sectors of education, thereby meeting the democratic demands being expressed at the time.

3 Conclusion

The SCF appears not to have survived the First World War. The International Commission on Mathematical Instruction itself was dissolved in 1920 because of the new international configuration and relaunched in 1928. The French mathematician Jacques Hadamard became one of its vice-presidents and then its president in 1932. During this second period, however, France’s participation in the work of ICMI was not as extensive or on the same collective scale as before the First World War. It is true that the reforming enthusiasm of the 1900s, evident on an international scale, had declined considerably, more particularly since the end of the war.

In secondary education, the syllabuses and principles of the 1902 reform, deemed excessively utilitarian or even too "primary" and even accused of being modelled on the German *Realschule* (Gispert 2014, p. 235), were finally abandoned in 1923. Thereafter, France's contribution to the work of ICMI was limited to a few – mainly factual – reports, compiled at infrequent intervals by leading figures. At the International Congress of Mathematicians in Bologna in 1928, the mathematician Albert Châtelet, at the time regional director of education (*recteur*) in the Lille school district, provided France's contribution to the series of reports on "essential changes in the teaching of mathematics in major countries since 1910" (Châtelet 1929). The subject was then taken up by two secondary school teachers in Paris, Julien Desforge and Guy Iliovici, who presented first a long report on "the theoretical and practical preparation of teachers" at the Congress in Zurich in 1932 (Desforges and Iliovici 1933), and then another on "current trends in teaching in public institutions" at the Congress in Oslo in 1936 (Desforge and Iliovici 1937). Furthermore, while the APMESP, in which Desforge was one of the leading figures at the time, remained an important vector in France for the circulation of the work of ICMI until the outbreak of the Second World War,[23] thereby continuing the dynamic initiated by Bioche, it also appeared henceforth, through its leaders, to be the preferred contact for the International Commission on Mathematical Instruction in the collection of information on the situation in France, enabling the association to circulate its information on an international scale.

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References

Allart, Marie-Noëlle. 2014. *L'Enseignement général dans la formation initiale d'État des ouvriers et employés, 1880–1959*. PhD thesis, Université de Caen.

Amieux, Anna. 1908. La femme aux États-Unis. *Questions pratiques de législation ouvrière et d'économie sociale* 9: 8–13 and 47–51.

Anonymous. 1909a. Chronique. Les travaux de la section de mathématiques et d'astronomie de l'Association française pour l'avancement des sciences. *L'enseignement mathématique* 11: 384–394.

Anonymous. 1909b. Commission internationale de l'enseignement mathématique. Rapport préliminaire sur l'organisation de la commission et le plan général de ses travaux. *Revue de l'enseignement des sciences* 21 (January) 32–36 and 22 (February): 82–88.

Appell, Paul. 1908. L'esprit scientifique et l'enseignement. *Revue internationale de l'enseignement* 56: 235–240.

Artigue, Michèle. 1996. Réformes et contre-réformes dans l'enseignement de l'analyse au lycée (1902-1994). In *Les Sciences au lycée. Un siècle de réformes des mathématiques et de la physique en France et à l'étranger*, ed. Bruno Belhoste, Hélène Gispert and Nicole Hulin, 197–217. Paris: Vuibert/INRP.

[23] See Barbazo (2010, annexe 19).

Auvinet, Jérôme. 2013. *Charles-Ange Laisant. Itinéraires et engagements d'un mathématicien de la IIIe République.* Paris: Hermann.

Barbazo, Éric. 2010. *L'Association des professeurs de mathématiques de l'Enseignement public (APMEP). Un acteur politique, scientifique, pédagogique de l'enseignement secondaire mathématique du 20e siècle en France*, PhD thesis, École des Hautes Études en sciences sociales.

Béghin, Henri. 1903. Extension du théorème de Carnot au cas où certaines liaisons dépendent du temps. *Journal de mathématiques pures et appliquées* 5(9): 29–34.

Béghin, Henri, Théophile Rousseau. 1903. Sur les percussions dans les systèmes non holonomes. *Journal de mathématiques pures et appliquées*, 5(9): 21–26.

Belhoste, Bruno. 1995. *Les Sciences dans l'enseignement secondaire français, t. 1: 1789–1914*. Paris: INRP/Economica.

Bioche, Charles. 1911. Sur le congrès de Milan. *Bulletin de la Société mathématique de France* 39: 522.

Bioche, Charles. 1914a. Nécrologie: M. Albert de Saint-Germain. 1839-1914. *L'Enseignement mathématique* 16: 481–483.

Bioche, Charles. 1914b. La Conférence internationale de l'enseignement mathématique. *Revue générale des sciences pures et appliquées* 25(9): 466–469.

Birck, Françoise, and André Grelon. 2006. *Un siècle de formation des ingénieurs électriciens, ancrage local et dynamique européenne, l'exemple de Nancy*. Nancy: Éditions de la Maison des sciences de l'homme.

Borel, Émile. 1904. Les exercices pratiques dans l'enseignement secondaire, conférence faite le 3 mars 1904 au Musée pédagogique. *Revue générale des sciences pures et appliquées* 15: 431–440.

Borel, Émile. 1914. L'adaptation de l'enseignement secondaire aux progrès de la science. *L'enseignement mathématique* 16: 198–210.

Boudier, J. et al. 1907. Opinions sur la méthode Méray. *Revue de l'enseignement des sciences* 9 (November): 314–318.

Bourlet, Carlo. 1907. *L'Esperanto. Conférence aux officiers de l'École supérieure de marine*. Paris: Hachette.

Bourlet, Carlo. 1910. La pénétration réciproque des mathématiques pures et des mathématiques appliquées dans l'enseignement secondaire. *L'Enseignement mathématique* 12: 372–387.

Brasseur, Rolland. 2011. Albert de Saint-Germain. *Bulletin de l'union des professeurs de spéciales* 236: 13–20.

Brasseur, Rolland. 2018a. Albert Lévy. *Dictionnaire des professeurs de mathématiques en classe de mathématiques de spéciales, online:* https://sites.google.com/site/rolandbrasseur/5%2D%2D-dictionnaire-des-professeurs-de-mathematiques-speciales

Brasseur, Rolland. 2018b. Théophile Rousseau. *Dictionnaire des professeurs de mathématiques en classe de mathématiques de spéciales, online*: https://sites.google.com/site/rolandbrasseur/5%2D%2D-dictionnaire-des-professeurs-de-mathematiques-speciales

Bruter, Annie. 2008. Le cours magistral comme objet d'histoire. *Histoire de l'éducation* 120: 5–32.

Buisson, Ferdinand. 1911. *Nouveau dictionnaire de pédagogie et d'instruction primaire*. Paris: Hachette.

Chapoulie, Jean-Michel. 2010. *L'École d'État conquiert la France. Deux siècles de politique scolaire*. Rennes: Presses universitaires de Rennes.

Charle, Christophe, and Eva Telkès. 1989. Béghin, Henri. In *Les Professeurs de la faculté des sciences de Paris. Dictionnaire biographique, 1901–1939,* 31–33. Paris: INRP.

Charle, Christophe. 1990. *Naissance des « intellectuels ». 1880–1900*. Paris: Éditions de Minuit.

Châtelet, Albert. 1929. Les modifications essentielles de l'enseignement mathématique dans les principaux pays depuis 1910. France. *L'Enseignement mathématique* 28: 6–12.

Chevallier, Henry. 1905. Quelques remarques sur l'enseignement de la géométrie par la méthode de M. Méray, à l'école normale d'instituteurs de Lyon. *Compte rendu de la 33e session de l'Association française pour l'avancement des sciences, Paris, t. 2*: 66–69.

CIEM [Commission internationale de l'enseignement mathématique]. 1908. Rapport préliminaire sur l'organisation de la commission et le plan général de ses travaux. *L'Enseignement mathématique* 10: 445–458.
CIEM. 1910. Chapitre III: sous-commissions nationales. *L'Enseignement mathématique* 12: 125–139.
CIEM. 1911. Compte rendu du congrès de Milan, 18–21 septembre 1911. *L'enseignement mathématique* 13: 437–512.
CIEM. Sous-commission française [SCF]. 1911a. *Rapports. Vol. 1: Enseignement primaire. Publié sous la direction de M. Ch. Bioche.* Paris: Hachette.
CIEM. Sous-commission française. 1911b. *Rapports. Vol. 2: Enseignement secondaire. Publié sous la direction de M. Ch. Bioche.* Paris: Hachette.
CIEM. Sous-commission française. 1911c. *Rapports. Vol. 3: Enseignement supérieur*. *Publié sous la direction de M. Albert de Saint-Germain*. Paris: Hachette.
CIEM. Sous-commission française. 1911d. *Rapports. Vol. 4: Enseignement technique*. *Publié sous la direction de M. P. Rollet.* Paris: Hachette.
CIEM. Sous-commission française. 1911e. *Rapports. Vol. 5: Enseignement des jeunes filles. Publié sous la direction de Mlle Amieux.* Paris: Hachette.
Coray, Daniel, Fulvia Furinghetti, Hélène Gispert, Bernard Hodgson, and Gert Schubring. (2002). *One Hundred Years of L'Enseignement Mathématique. Moments of Mathematics Education in the Twentieth Century*. *Proceedings of the EM-ICMI Symposium, Geneva, 20–22 October 2000*. Genève: L'Enseignement Mathématique.
d'Enfert, Renaud. 2003. *L'Enseignement mathématique à l'école primaire, de la Révolution à nos jours (T.1: 1791–1914).* Lyon: Institut national de la recherche pédagogique.
d'Enfert, Renaud. 2015. L'introduction de la notion de fonction et des représentations graphiques dans la première moitié du XXe siècle. Enjeux méthodologiques et historiographiques d'une approche horizontale. In *Tables, Tableaux, Graphiques. Actes de la 13^e journée d'étude de l'école doctorale ED 400 Savoirs scientifiques*, ed. Michèle Artigue and Matthieu Husson, 23-31. Paris, Université Paris Diderot. Online: http://ed400.ed.univ-paris-diderot.fr/actes-de-lajourn%C3%A9e-d%C3%A9tude-2013.
d'Enfert, Renaud. 2016. Entre mathématiques et technologie: l'enseignement du dessin géométrique dans le primaire et le secondaire (France, 1880-début XXe siècle). *HISTEMAT* 2(2): 39–55.
Desforge, Julien, and Guy Iliovici. 1933. Rapport sur la préparation théorique et pratique des professeurs de mathématiques de l'enseignement secondaire. *L'Enseignement mathématique* 32: 208–239.
Desforge, Julien, and Guy Iliovici. 1937. Les tendances actuelles de l'enseignement public. *L'Enseignement mathématique* 36: 247–257.
Domage, Claire-Marie. 2013. *L'Impact de la réforme de 1902 sur l'enseignement de la géométrie. Étude des manuels du premier cycle de l'enseignement secondaire (1902–1914)*. Master thesis, université Paris 7 Diderot.
Duclert, Vincent. 2006. *Alfred Dreyfus : l'honneur d'un patriote*. Paris: Fayard.
Duval, Nathalie. 2009. *L'École des Roches.* Paris: Belin.
Fort, Louis, and André Muxart. 1910. *Leçons de cosmographie conforme aux programmes du 27 juillet 1905. Classes de mathématiques A et B. Préparation aux Écoles.* Paris: Henry Paulin et Co.
Gispert, Hélène. 1991. *La France mathématique. La Société mathématique de France (1870-1914)*. Paris: Société française d'histoire des sciences et des techniques.
Gispert, Hélène, Nicole Hulin, and Marie-Claire Robic. 2007. *Sciences et enseignement. L'exemple de la grande réforme des programmes du lycée au début du XXe siècle.* Paris: INRP/Vuibert.
Gispert, Hélène. 2014. Mathematics Education in France: 1800–1980. In *Handbook on the History of Mathematics Education*, ed. Alexander Karp and Gert Schubring, 229–240. New York: Springer.

Guitton, Ernest. 1909. *Résumé aide-mémoire. Algèbre, rédigée conformément aux programmes officiels de l'enseignement secondaire, Seconde et première C, D. Baccalauréat 1ère partie.* Paris: Hachette.

Guitton, Ernest. 1913. *Cours d'algèbre rédigé conformément aux programmes officiels du 4 mai 1912. Classes de mathématiques A et B*. Paris: Hachette, coll. « Cours complet de mathématiques, sous la direction de M. Carlo Bourlet».

Héry, Évelyne. 2016. La réforme pédagogique des lycées en 1902. *Carrefours de l'éducation* 41 (June): 31–46.

Hulin, Nicole. 2011. *Culture scientifique et humanisme. Un siècle d'engagement sur le rôle et la place des sciences*. Paris: L'Harmattan.

Jey, Martine. 2000. Crise du français et réforme de l'enseignement secondaire (1902–1914). *Études de linguistique appliquée* 118 (June): 163–178.

La revue. 1907. Notre programme. *Revue de l'Enseignement des sciences* 1: 1–2.

Laisant, Charles-Ange. 1901. Une exhumation géométrique. *L'Enseignement mathématique* 3: 98–105.

Laisant, Charles-Ange. 1907. Sur la méthode de M. Méray pour l'enseignement de la géométrie. *Revue de l'enseignement des sciences* 9 (November): 312–314.

Laisant, Charles-Ange. 1910. Commission internationale de l'enseignement mathématique. *Association française pour l'avancement des sciences. Compte-rendu de la 38e session Lille 1909. Notes et mémoires*: 30–32.

Lévy, Albert. 1909-1910a. Sur les nombres premiers, *Bulletin de mathématiques élémentaires* 15: 242–244.

Lévy, Albert. 1909-1910b. Sur une équation du second degré en nombre entier. *Bulletin de mathématiques élémentaires* 15: 113–115

Lietzmann, Walther. 1908. Le mouvement réformateur de l'enseignement mathématique en Allemagne. *Revue de l'enseignement des sciences* 20 (December): 433–446.

Marotte, Francisque. 1907. Les "Nouveaux Éléments de Géométrie" de M. Ch. Méray. *Revue de l'enseignement des sciences* 10 (December): 359–367.

Méray, Charles. 1903. *Nouveaux éléments de géométrie*. Dijon: Jobard (1st ed. 1874. Paris: Savy).

Méray, Charles. 1904. Justification des procédés et de l'ordonnance des Nouveaux éléments de géométrie. *L'enseignement mathématique* 6: 89–123.

Mironneau, Adolphe. 1902. Une nouvelle méthode pour l'enseignement de la géométrie. *Revue pédagogique*, 2nd semester: 43–54.

Nabonnand, Philippe. 2006. La création du certificat de mathématiques générales à Nancy. In *Un siècle de formation des ingénieurs électriciens, ancrage local et dynamique européenne, l'exemple de Nancy*, ed. Françoise Birck and André Grelon, 123–154. Nancy: Éditions de la Maison des sciences de l'homme.

Nabonnand, Philippe. 2007. Les réformes de l'enseignement des mathématiques au début du XXe siècle. Une dynamique à l'échelle internationale. In *Sciences et enseignement. L'exemple de la grande réforme des programmes du lycée au début du XXe siècle*, ed. Hélène Gispert, Nicole Hulin, and Marie-Claire Robic, 293–314. Paris: INRP/Vuibert.

Prost, Antoine. 1968. *Histoire de l'enseignement en France, 1800–1967*. Paris: Armand Colin.

Ringer, Fritz. 2003. La segmentation des systèmes d'enseignement. Les réformes de l'enseignement secondaire français et prussien, 1865-1920. *Actes de la recherche en sciences sociales* 149(4): 6–20.

Rollet, Laurent. 2009. Peut-on faire l'histoire des pôles scientifiques? *Histoire de l'éducation* 122: 93–113.

Rollet, Laurent. 2010. Des mathématiciens dans l'affaire Dreyfus? Autoforgerie, bertillonage et calcul des probabilités. Online: *Images des Mathématiques*, CNRS, 2010, http://images.math.cnrs.fr/Des-mathematiciens-dans-l-affaire.html.

Rousseau, Théophile. 1909. La géométrie élémentaire basée sur le groupe de déplacements. *L'enseignement mathématique* 11: 81–97.

Saint-Germain, Albert de. 1877. *Recueil d'exercices sur la mécanique rationnelle, à l'usage des candidats à la licence et à l'agrégation des sciences mathématiques*. Paris: Gauthier-Villars.
Saint-Germain, Albert de. 1911. La Commission internationale de l'enseignement mathématique. *Revue générale des sciences pures et appliquées* 22(12): 473–475.
Serginette. 1911. La Maison des Lycéennes. *Annales politiques et littéraires,* 25 juin: 648.
Tannery, Jules. 1903. L'enseignement de la géométrie élémentaire. *Revue pédagogique*, new. ser. 43(7): 1–27.
Vareil, Auguste. 1907. La géométrie enseignée par la méthode Méray. *Revue de l'enseignement des sciences* 9 (November): 307–312.
Vessiot, Ernest. 1914. Discours prononcé par M. le président à la réception des membres de la Commission internationale de l'enseignement mathématique. *Bulletin de la Société mathématique de France* 42: 41–43.

Chapter 3
The German IMUK Subcommission

Gert Schubring

Abstract The German subcommittee of IMUK was surely one of the most active of the various national committees, in particular due to the enormous organisational capacities of Felix Klein who successfully forged teams that worked collectively to produce reports of remarkable quality. The great number of reports was due, on the one hand, to the territorial structure of the German confederation with autonomy in education for all of its members, characterised by differing cultural traditions, and, on the other hand, to Klein's conception to achieve not only reports on the state of mathematics instruction but to initiate volumes reflecting – for the first time – on basic issues of mathematics education, a discipline still in its very early stages of development.

Keywords Felix Klein · Walther Lietzmann · Paul Stäckel · Wilhelm Lorey · Brussels meeting · Cambridge Congress · Dissolution of IMUK · Thematic reports

1 Setting the Scene for the German Subcommission

The decision of the Fourth International Congress of Mathematicians on April 11, 1908, in Rome to create the IMUK had been formulated in rather general terms: it asked Felix Klein, Henry Fehr and George Greenhill to "constitute an international committee" to investigate the state of mathematics teaching in the secondary schools in "the various nations" and to report about them at the next congress in 1912. Thus, the structure of that committee and its mode of working remained entirely open. Also, its name was not yet defined. The only definite decision was the restriction to secondary schools, following the intentions of David Eugene Smith, who initiated the creation of IMUK (Schubring 2008, p. 5). This restriction was soon removed,

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thanks to Klein who extended the task to all levels and kinds of instruction, favouring in particular primary schools, as essential basis for a success of teaching in the secondary schools.

It was after the congress that Smith, indefatigable to make his decision work, expanded the conceptions for initiating the activities – mainly at first in conversations with Fehr. The name of the committee – then in German and in French – is due to them, as well as the name "Comité Central" (in the following text given as CC) for the three nominated presiders. Fehr complained in a letter to Smith dated June 22, 1908, about an alleged passivity of Klein. Fehr had aimed at immediate action, only by correspondence. Klein, however, had envisaged a much broader scope and had therefore prepared a larger agenda, including various meetings in September and, in particular, a meeting of the CC to base the coming intense work on personal acquaintance of its members.

Klein, being very well aware of the dimensions of this first international collaborative work forcing him additionally to assume the presidency of the projected German subcommission, took as a first measure to search for an assistant who would be able to assume the technical aspects of the work. At first, he had thought of August Gutzmer (1860–1924), mathematics professor at Halle University, who had already been his essential cooperation partner in the two committees for the mathematics curricular reform movement in Germany, the *Breslauer Unterrichtskommission*, 1904 to 1907, and its successor from 1908, the *Deutscher Ausschuß für mathematischen und naturwissenschaftlichen Unterricht* (DAMNU). Gutzmer had been president of both committees; thus, he had been too busy to accept this additional task.

Then, upon reading a recently published paper by Walther Lietzmann (1880–1959), a mathematics teacher at an *Oberrealschule*, Klein thought he might be the right person. The paper was an excellent document on the methods of geometry teaching in Italy, studied from an international comparative viewpoint (Lietzmann 1908). Klein wrote a long letter inviting Lietzmann to serve as his secretary for IMUK matters and for the German subcommittee. However, there came no answer – differing from the rapid communication to which Klein was accustomed. It turned out that Lietzmann had not received this letter, passing his summer vacation in Italy. Then eventually, he received the invitation and accepted gladly (Schubring 2008, p. 7). From then on, a close cooperation of Klein with Lietzmann became established, providing the basis for the enormously productive work of the German subcommission.[1]

[1] Klein promoted then decisively Lietzmann's career. In 1908, Lietzmann, although quite young, was an *Oberlehrer* of mathematics and physics – traditionally a rank for senior teachers – at the *Oberrealschule* in Wuppertal-Barmen. In 1913, he was called to Jena, as director of the *Oberrealschule* there. At Jena University, he began to give lectures on the teaching of mathematics, as an extraofficial activity, much favoured by Klein – as a step to institutionalise didactics of mathematics within teacher training. After WW I, Klein succeeded in having Lietzmann called to Göttingen as director of the *Oberrealschule*, combined with a *Reformrealgymnasium* – today, the school is named Felix-Klein-Gymnasium. Lietzmann remained in this position until his retirement in 1946. He continued in Göttingen with a *Lehrauftrag* for didactics of mathematics at the university.

Besides assuring effective working conditions, Klein had envisaged that this novel task required formal and institutional agreements and decisions. This could best be achieved in agreement with the German mathematicians association: *Deutsche Mathematiker-Vereinigung* (DMV). The DMV would have its next annual meeting on September 23 and 24, in Cologne, and its directorate would deliberate the day before, the 22nd. Moreover, Klein had been aware that such extensive work required financial backing and was preparing to obtain it.

2 Initiating Jointly the IMUK Work and the German Contributions

Fortunately, the activities of Klein and of the German subcommission were fairly well documented and preserved. For each meeting of the German group, the minutes were written and distributed, and information letters were sent to the group members. In addition, the extensive number of Klein's letters to Lietzmann pushing the issues of the committee and of the publications ahead is preserved, too.

A summary of the first activities regarding IMUK in general and the German commission in particular, apparently written by Lietzmann in the midst of March 1909, shows the amplitude of the undertaking.

In July 1908, Smith had stayed for a fortnight at Göttingen; it was there that Klein and Smith established the guidelines and the procedures for initiating the international works and the national contributions. On this basis, Klein was able to prepare various meetings in the second half of September, all in Cologne, using the context of the annual DMV meeting.

The first important steps were the decisions by the DMV directorate on September 22. Firstly, two German members for the international IMUK body were nominated: Klein and Peter Treutlein (1845–1912). Klein was concerned that the German governments might not accept the three delegates, which the Fehr-Smith plan had projected for Germany. Therefore, the DMV decided that the delegates could co-opt a third member in case there would be no obstacle (Gutzmer 1916, p. 334). In fact, no objection was raised, and hence, Klein and Treutlein co-opted Paul Stäckel (1862–1919) (SUB Klein I, fol. 64). These three members represented three currents

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The range of Lietzmann's activities can hardly be exaggerated. Besides becoming the secretary of DAMNU in 1910, too, he served over decades in the teacher examination board at Göttingen University, but mainly he was the leading didactician for mathematics at secondary schools – as editor of the ZfmnU and as successful author of a *Methodik* – guiding over decades mathematics Gymnasium teachers in their practice. Moreover, he published an enormous number of books, mainly for the use by teachers. See my biography of Lietzmann in the ICMI officers gallery: http://www.icmihistory.unito.it/portrait/lietzmann.php.

His relation to Nazism is doubtful but not yet clarified. One reason for doubts is his autobiography; published posthumously, his friends deleted the chapter on the Nazi period; my search for its manuscript was without success. Another hint are historical booklets, published only in the Nazi period, emphasising the Teutonic contributions to geometry in prehistory.

within German mathematics: Klein for the university tradition; Stäckel – then mathematics professor at the *Technische Hochschule* Karlsruhe – mathematics at higher technical education;[2] and Treutlein, mathematics teacher and director at a reform Gymnasium,[3] in Karlsruhe, in the southern state of Baden. At the same time, Klein and Stäckel represented Northern Germany, while Treutlein represented southern German states.

At the same time, the DMV also nominated members for the German subcommission: besides Klein – again as president – the nominees were Gutzmer, Friedrich Pietzker (1844–1916), Friedrich Poske (1852–1925), and Heinrich Schotten (ibid.). Clearly, these were highly political choices. Gutzmer was evident as representing university mathematics and as president of the DAMNU. Pietzker, a mathematics teacher at a Gymnasium in Nordhausen/Prussia, was the editor of one of the two key German journals for mathematics and sciences teaching, *Unterrichtsblätter für Mathematik und Naturwissenschaften*, and at the same time the president of the German Association for promoting the teaching of mathematics and the sciences. Pietzker was one of the obstinate opponents of Klein's curricular reform movement; he was thus chosen to integrate him somewhat into the movement.[4] Poske, teacher of mathematics and physics at a Gymnasium in Berlin, had been an active member of the *Breslauer Unterrichtskommission*, representing the German Physics Society, and now a member of DAMNU. At the same time, Poske was editor of the journal for science teaching *Zeitschrift für den physikalischen und chemischen Unterricht*. Schotten was the director of an *Oberrealschule* (modern school type, without Greek and Latin) at Halle (Saale) in Prussia and the editor of the other key journal, the *Zeitschrift für den mathematischen und naturwissenschaftlichen Unterricht* (ZfmnU). He, too, was a member of the DAMNU. As Gutzmer confirmed, it was on purpose to have the editors of the most important and pertinent journals for mathematics and/or science teaching represented in the commission – Gutzmer himself was the editor of the DMV journal: *Jahresbericht der Deutschen Mathematiker-Vereinigung* (Gutzmer 1916, p. 334).

Yet, Pietzker apparently did not want to become involved. He did not participate in the works of the subcommission and resigned soon after, diplomatically, due to health reasons, as Klein reported at the second meeting of the subcommittee (SUB Klein I, fol. 101).[5] His substitute was Albrecht Wilhelm Thaer (1855–1921), a mathematics teacher and director of an *Oberrealschule* in Hamburg. He became Pietzker's successor as editor of the *Unterrichtsblätter*.

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[2] Paul Stäckel is well-known for his seminal research on the history of non-Euclidean geometry. His contributions for the IMUK work are very important, too: the German report on the role of mathematics at the technical colleges and the related international report on the role of mathematics in the formation of engineers, for the 1914 Paris IMUK Congress.

[3] The obituary by Behm describes Treutlein's rather uncommon reform conceptions and realisations (Behm 1912). Treutlein is the author of a famous textbook for geometry teaching based on *Anschauung* (1911), thus in neat agreement with Klein's conception for a reformed mathematics curriculum.

[4] Pietzker was likewise obstinate in rejecting non-Euclidean geometry.

[5] The minutes of the first meeting are missing, as Klein noted (SUB Klein II, fol. 17).

Klein, much devoted to have the IMUK work officially registered to assure the receipt of financial subsidies, had informed the government of the German Reich after the Cologne meetings of the constitution of the German IMUK delegates and the creating of the German national committee. Moreover, on December 15, 1908, Klein formally asked the Ministry of the Interior of the Reich to grant the necessary funds (SUB Klein I, fol. 64).

From early January of 1909 on, Klein worked intensely, meeting with his co-delegates and subcommission members as well as with potential report authors to establish an agenda for the elaboration of the reports on mathematics teaching in Germany. The report, written in mid-March, was able to give the first projection of future reports. The list shows that a systematic list of subjects to be treated had not yet been established. And the publications had been envisaged in a rather traditional manner, not as books, but as "Aufsatz" – translated as essay, paper or treatise. Also, the projected name of the series where they should be published confirm the originally intended modest goals: "Berichte und Mitteilungen, veranlaßt durch die Internationale Mathematische Unterrichts-Kommission" – reports and communications, occasioned by the IMUK. A translation of Fehr's first text for the IMUK agenda, by Lietzmann, published in the ZfmnU, was defined as the no. I of this new series. Numbered from II to XI, ten reports were projected – some with names of authors and others where authors still needed to be defined. What should later become a genuine book was planned here as an essay: Lietzmann on mathematics instruction in Northern Germany. What occupied Klein's particular interests, mathematics teaching for girls, was covered by an already ready paper; however, later on it turned into a proper book, by another author. The first paper was published in the *Berichte* series. One could remark that the reports should consider the confederation structure of the German Reich (with 25 states constituting this confederation): an "Aufsatz" on Northern Germany, one more on Saxony, and Treutlein should treat Southern Germany – Baden, Bayern, Hessen and Württemberg were entrusted to him. Two projects, where no author was yet defined, document Klein's ample reform programme: mathematics at technical secondary schools and mathematics at primary schools and teacher training institutions for them. What would later become two important books was here projected as just one *Aufsatz*, with an explicit historical direction: the development of mathematical formation of future teachers, at universities and technical colleges. Wilhelm Lorey (1873–1955) was envisaged to be the author, whom Klein had "detected" for IMUK work, thanks to a paper on the importance of secondary schooling for girls (ibid., fol.s 66–67). Another important report was planned for mathematics at technical colleges – a sensitive issue since the anti-mathematical movement by German engineers (see Schubring 1989). The report was envisaged to be written by Paul Stäckel. Stäckel was also entrusted with organising the international report on this subject, for the first "ICME" in Paris in 1914.

What was already decided, however, was that Teubner should publish these reports. This proved in fact to be a stable solution, and this publisher realised all of Klein's desires by producing proofs quickly and distributing proofs among all concerned collaborators of a given project.

3 Elaborating the Projects of the German Subcommission

Already less than 1 month after this first summary of the German IMUK activities, at the first meeting of the German IMUK delegates, on April 7 and 8, 1909, there had already been projected a more complete set of reports to be composed. For instance, one had become aware that it was not possible to deal jointly with the various Southern German states; now, for each state a separate report and a proper author had been defined (ibid., fol. 68). Eventually, there were seven states in Southern and Middle Germany for which reports on the state of mathematics instruction were published, the former ones complemented by Elsaß-Lothringen, Thüringen and Saxony.

The second meeting, on October 10, 1909, showed a well-developed state of the preparations. Now, the reports were no longer called “Aufsatz” but “Heft” or booklet. As Klein reported in this second meeting of the German subcommission, Lietzmann had proved his high efficiency: he was the first to have already finished one of what would become of his five reports – this first one on contents and methods of mathematics instruction at secondary schools in Northern Germany (thus, essentially, in Prussia). His *Heft* comprised 114 pages; thus, one might call it rightly a book.

The original 10 reports had been increased to 17 projected ones. Besides reports on the situation in specific states or groups of German states and at particular types of schools, one envisaged now thematic studies. In addition to the already defined report on teacher training, it now included reports on *Linearzeichnen* – linear drawing – and on mathematics in mechanics and physics instruction.

Thaer proposed and assumed a report on mathematics instruction in the *Hansestädte* – Hanseatic cities – Hamburg, Bremen and Lübeck, thus differentiating somewhat the reports so far focused on Northern Germany as a unity.

Usually, proposals for additional topics were accepted, and the problem was only to find competent authors. But there was one proposal which was several times discussed but eventually not accepted: Heinrich Emil Timerding (1873–1945), mathematics professor at the Technical College Braunschweig charged with producing the report on mechanics and physics,[6] had proposed in the April 1909 meeting a report on mathematics instruction in the Catholic Orders – and not only in Germany but also in Belgium and in the Netherlands, Austria and Switzerland (ibid., fol. 68). In the next meeting, Klein commented upon this project; he spoke about the importance of mathematics at Benedictine and Jesuit schools. However, he realised that this proposal depended on the results of a finding mission. The DAMNU, which had asked for a travel grant, had been denied it. Klein countered by offering that the Teubner publisher would finance it. This point ended with vivid pleas by Thaer and

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[6] Not much is known about his biography. After Treutlein’s death in 1912, the DMV choose Thaer as his successor as IMUK delegate and then Timerding became Thaer’s successor in the IMUK subcommission.

Treutlein for such a report (ibid., fol. 103). However, no such report was written; maybe, Timerding did not carry out the study trips in various countries, or he thought the results he obtained were not satisfying.

For Klein, the projected report on primary schools was of special importance; it was mentioned in all the meetings, but it had to be delayed many times because of difficulties finding a competent author. Moreover, information material was awaited, which was being prepared by DAMNU.

And now, the publication policy had been redefined: the initially envisaged series *Berichte und Mitteilungen* had been restricted to reports on activities of the IMUK body, being published as supplements to the journal ZfmnU, whereas the publications of the German subcommission constituted now a new series – *Abhandlungen über den mathematischen Unterricht in Deutschland, veranlasst durch die Internationale Mathematische Unterrichtskommission* (Treatises on mathematics instruction in Germany, and published by Teubner) (ibid., fol. 101).

Klein was able to report in this second meeting the success he experienced in asking for grants for financing the German IMUK activities: the Reich had allotted 5,000 marks and Prussia 5,000 marks, too. The other German states had not yet made such grants, but authors of special reports for a state would be granted aids. Klein generalised this as a German mission for IMUK: Germany, being ahead with its publications to all other countries participating in the IMUK work, saw it desirable to continue staying at the top. Germany would thus show "which ways are to be taken in this work in the individual countries" (ibid., fol. 101).

It is significant to observe the working mode, which Klein had developed for this first really cooperative endeavour of producing an extended series of reports. He would invite, besides the officials, authors of the reports in preparation and other experts, such as the publisher or from some ministry. As Klein explained, this broad working atmosphere, which established personal contacts between the various competencies represented, should enable a deepened quality of the reports (ibid., fol. 117). The direct communication would also help to avoid overlapping which might easily occur between the numerous reports. Likewise, it was within the joint meetings that proposals for reports and nominations for their authors were discussed and decided.

4 Striving for Excellence: Preparing the Brussels Meeting

The next meeting, which occurred on December 30, 1909, besides revising the state of the planned projects – without launching new ones – revealed more pressure for rapid progress. So far, there had been already the pressure to finish the reports – for all participating countries – until the next ICM, in Cambridge in 1912. But now, another and earlier event had become a concern: the World Exposition, in preparation for 1910 (April to October), in Brussels. From various countries participating at this major event for demonstrating one's technical advances, expositions presenting innovative aspects of their educational systems were being planned. As Klein reported, the German states of Prussia, Saxony and Hamburg were organising a school exhibition. And Klein was preparing proposals to the Prussian Ministry concerning the IMUK work to be organised for Brussels, during some days in August or September of 1910. The IMUK CC – in German it is simply called "Hauptausschuß" (the Main Committee) – would meet there. During this time, there would be a public meeting of the subcommissions of Belgium and neighbouring countries and a series of conferences in connection with the German school exhibition. Klein pressured to have as much reports as possible ready; their manuscripts would be sent by Easter (1910) (ibid., fol. 105).

The preparation of the reports to be presented there – as well as the German exhibition contributions – occupied intensely the agenda over the next months. But this pressure occasioned also a reflection process on the format of the German reports and, thus, provided an opportunity to improve the internal structure of the reports. The issue had already been discussed in the December 1909 meeting; however, because it had not yet been decided, Klein sent a general message in January 1910 exposing how to obtain a shared structure. The process of elaborating the reports had revealed the problem of how "general" issues should be treated in the special reports on individual states and how issues concerning particular states should be treated in the general reports. This question was especially important since Prussia was by far the greatest among the 25 states of the confederated *Reich*. Thus, a situation in Prussia should not be taken as a priori general. Klein proposed:

- Some reports concerning all of Germany. For instance, the report by Stäckel on mathematics for engineers at the technical colleges and the report on mathematics at technical secondary schools.
- A second type were reports analysing the respective issue for Prussia, due to the competence of their authors, but also presenting at some instance the general German aspects. Examples included the report by Timerding on mathematics in the textbooks for physics and mechanics and the report by Paul Zühlke on linear drawing.
- A third type were the reports on individual states, like Baden or the Hanseatic cities. They would exclude mathematics instruction at primary schools, technical schools and technical colleges; instead, their subject would be the entire system of secondary schools and universities but only as it pertained to teacher education. And for this area, the reports would analyse all official regulations in the respective state and, regarding the general issues, all variation in what is exposed in the respective report. Examples for variation included coeducation, secondary schooling for girls, homework, textbooks, etc. (ibid., fol. 106).

Klein's proposals were accepted (ibid., fol. 101). Clearly, this afforded a close cooperation to assure this complex structure of general and particular. To achieve this, all the reports had been assigned to specific groups: initially there were four groups, but these were expanded to include five groups. The groups were subsequently called volumes:

(I) Secondary schools in Northern Germany
(II) Secondary schools in Southern and Middle Germany
(III) Specific issues of mathematics instruction in secondary and higher education
(IV) Mathematics at technical schools
(V) Elementary mathematics instruction and mathematics at the institutions for teacher education

The complex structure afforded a good coordination and so coordinators served for each such volume – at the moment, Stäckel for II, Klein for III and Treutlein for IV (ibid., fol. 107).

In a new general message dated February 11, Klein gave the information about the now defined data for the activities at Brussels: a meeting of the CC on August 10 and the expositions on mathematics and science instruction on August 11 and 12. He reiterated the pressure to present as many printed reports as possible "so that Germany would be able to maintain the lead which it had since" (ibid., fol. 101). He reinforced the need for cooperation, fine-tuning between neighbouring reports, and to have their drafts ready for the next subcommission meeting on March 23.

By then, the Brussels agenda had changed a bit: the CC would meet on August 9, followed by a meeting of the members of all the national subcommissions on the morning of August 10. In the afternoon there would be a public meeting, with a general presentation of the IMUK work by Klein and Fehr and a lecture by Carlo Bourlet. On the 11th and 12th would follow expositions and talks concerning the German IMUK work, among others, by Thaer and Treutlein (ibid., fol.s 108–111). It was envisaged to be able to present 10 of the so far 13 prepared reports in printed form to the CC meeting.

More subjects for reports were proposed and accepted in this meeting, revealing the broad range of institutions where mathematics was taught and, therefore, implying a field of application. On one hand, more types of technical schools – navigation schools and formation of surveyors – were included, while on the other hand more schools of a higher education status (e.g. forest academies (Forstakademie), artillery and engineering schools, agricultural colleges, commercial colleges (Handelshochschule), art academies and the formation of insurance technicians and of opticians).

Regarding finances, Saxony and Hamburg agreed to reimburse the expenses occurred by the authors on the reports for these states. For other states, one was still hoping for grants (ibid., fol. 111) – actually not being as successful as with Prussia and the *Reich*.

The definite agenda for the Brussels meetings was sent on July 1. There were additional changes, which included not holding separate meetings of the CC and the national commissions, but a joint one, on the morning of August 10. On August 9, there was a convening in the evening, in a *Brasserie*. The programme as planned for IMUK in general and for the German side was rich in presentations and is documented here as Appendix I (ibid., fol.s 112–113).

In a letter to Lietzmann dated July 21, 1910, Klein wrote to him – given that the preparations for Brussels were finished – about the continuation of the German IMUK work after Brussels. Klein said, “I do not want that after Brussels might at first occur a vacuum – I am rather hoping to be really finishing in 1912” (SUB Lietz I, fol. 53). This is one instance where Klein showed how anxious he was to finish in time the enormous work that had been initiated.

5 On the Way to the Cambridge Congress

At the next meeting of the German IMUK, on October 23, 1910, one was able to draw a positive balance of the activities in Brussels. Now the subcommission had been active for 2 years. Nine of the German reports were presented there in printed form – of the eventually 38 reports. Although the Cambridge Congress, where all reports would be presented, was now less than 2 years ahead, the meeting still discussed and accepted more proposals for reports.

The most significant part of these proposals was the extension of studies on particular aspects of mathematics teaching, which in fact meant the first systematic contributions to mathematics education. These were the contributions in volume III on *Einzelfragen*. For Brussels, three such studies were prepared: on mathematics in the teaching of mechanics and physics, on the progress of the mathematics curricular reform movement and on linear drawing and descriptive geometry. The report planned since the beginning, the report by Lorey on the development of teacher education, soon differentiated into a separate and, thus, a second report by Lorey on the study of mathematics at German universities. This second report, however, was always delayed, and its conceptual changes will be discussed below. But now, four more studies were proposed:

- On astronomy, surveying and mathematical geography at secondary schools
- History of mathematics at secondary schools
- Mathematics and philosophical propaedeutic
- Commercial mathematics (ibid., fol. 116)

All four proposals were realised, in 1911 and in 1912. The volume on philosophical propaedeutic (145 pages) corresponded to the traditional orientation of mathematics towards philosophy and logic. Most innovative was the volume on the role of mathematics history in the teaching of mathematics, which predated to a considerable degree the modern movement in mathematics education to promote the use of history in the teaching of mathematics. It was written by Martin Gebhardt (1868–?), who was active in research on the history of mathematics. The most significant study was, however, not yet proposed here: the study on psychology and mathematics instruction (see below). It proves the enormous perspicuity of Klein to have “detected” this subject addressing the fundamentals of mathematics education, a discipline still in its really first stages – pre-paradigmatic in Thomas Kuhn’s terms (see Schubring 2016).

And now, eventually, one felt sufficiently prepared to attack the rather unknown field of mathematics in primary schools and to plan contributions for volume V. The indefatigable Lietzmann had agreed to write two studies: one on the teaching of reckoning ("Rechnen") and a second one on the teaching of elementary geometry ("Raumlehre"). Further reports on aspects of mathematics in primary schools were in preparation.

For the next meeting of the subcommission, on April 20, 1911, the agenda included a definitive determination of the programme of the *Abhandlungen*. And Klein noted in his copy of the invitation message: "keine neuen Stoffe mehr aufnehmen!" – no more subjects to be admitted! (SUB Klein II, fol. 46). In fact, the minutes of this meeting gives the most complete list of the programme to date, with eight studies for volume III and volume V now completely planned, with six reports – and no new projects.

From September 18 to 20, 1911, a first IMUK conference was to be held in Milan (Italy) to discuss two of the general thematic issues. Contrary to the preparation for Brussels, this was rather "normal business" and did not require so much effort in preparation from the German side as before. Klein mentioned the Milan conference briefly in the invitation letter for the April meeting but stressed again the ambition for excellence, "We should prepare all in an optimal manner in order to result as magnificently as in Brussels", by presenting a greater number of printed reports in the interim (SUB Klein I, fol. 117). The minutes of the April meeting did not mention particular preparations for Milan. The invitation for the autumn meeting said that 16 reports of the German *Abhandlungen* had been presented (SUB Klein II, fol. 50). And in the minutes of the autumn meeting of the subcommission, on October 15, 1911, it is only mentioned briefly that Klein reported about the Milan conference and on preparations for the fifth International Conference of Mathematicians in Cambridge, on August 22–28, 1912 (SUB Klein I, fol. 112).

The main issue of the meeting was to check how far the programme had progressed and, in particular, whether the reports would be ready until the ICM. As a matter of fact, one was far from being ready until then. About ten reports would not be ready until the conference, mainly in volumes III, IV and V.

Unfortunately, three documents are missing for the year 1912, which will all have treated with the preparations for Cambridge: the *Rundschreiben* (general messages) 14, 15 and 16. The next (and last) preserved one is number 17, dated April 1913. The only document available on this period is the report on the activities of the German subcommission from 1908 to 1912 by August Gutzmer, delivered at the ICM and published in English. Gutzmer reminded that, due to German history, one "should not expect to find a homogeneous system of schools, controlled by a central board of education, as is usually the case in other countries". He recalled that the "various sections of the German people", which represented different sources of culture, and the reformation, which increased the variety of German schools and the "modern development of Germany from an agricultural state to an industrial one", led to a great difference in school types (Gutzmer 1912, p. 818). As he emphasised, "a recognition of all these influences, the political, the religious and the economical, is essential to a complete understanding of German education" – and this complex structure being “in evidence in the general plan of the German reports as well as in the individual essays of which it consists”. Gutzmer called the attention for the collective character of the elaboration of the reports, being organised by Felix Klein and Lietzmann as the secretary of the German subcommittee – and Klein having coordinated volumes I, III and V – while Stäckel had coordinated volume 4 and Treutlein, whose premature death 3 weeks before the congress was deeply deplored, volume II.

Since it was not possible to comment on all the reports printed, Stäckel decided to focus his comments on the reports in volume III; it is highly significant that this is just the volume with the studies going beyond the official reporting task of IMUK and opening to more general issues of mathematics education. For this task, he highlighted Schimmack’s book on the history of the mathematics curricular reform in Germany and Timerding’s book on mathematics in mechanics and physics teaching; he mentioned summarily the studies on applied mathematics and descriptive geometry. Then, he highlighted Gebhardt’s book on history of mathematics, “as a means for raising the interest of the student in the subjects of the secondary school” (ibid., p. 819). With major emphasis, Stäckel commented on a study of the relation between mathematics and philosophy, due to “a valuable training of philosophy” in German upper grades of secondary school: “I am of the opinion that this paper will be found to obtain much that will prove to be of value and of general interest to all readers” (ibid.). While Katz’s book on psychology still is not mentioned, Stäckel presented Lorey’s book, here restricted to “the study of mathematics at the German universities since 1870”, as “just going to press” – a strange error, since it became printed only in 1916, as the last publication of the whole endeavour.

In the last paragraphs, Gutzmer spoke about the successful movement for curricular reform in Germany and extended this to underline the status of mathematics teaching as one of three principal teaching subjects in secondary schools:

> This reorganization aims at making the youth of our country sympathetic with labor as well as appreciative of the best that is in modern culture. From this point of view the teaching of mathematics and science assumes a position equivalent to that in history and languages. (ibid., p. 820)

It is highly revealing to see here justified the equal status of mathematics with its two functions: the utilitarian and the formative.

Stäckel underlined another characteristic pattern of mathematics teaching in Germany: the considerable degree of methodical liberty characterising the practice of teachers and the educational system in general, having “scarcely an analogy in any other of the leading countries of the world”. He gave two examples for this basic pattern: the first being that “teachers are merely obliged to follow certain general outlines given by the minister of public instruction, without being slavishly bound to the textbooks that are used in their schools”, and the second being that the problems for the final examination are not prescribed centrally but defined by the teachers in each school themselves (ibid., pp. 819–820).

6 The After-Cambridge Period

In the files on the German subcommission, nothing is told about the prolongation of the IMUK mandate until the next ICM, which occurred in Stockholm (Sweden) in 1916. The *Rundschreiben* no. 17, dated April 9, 1913, written jointly by Lietzmann and Klein, defined what remained to be done and ended the collective work that had been done so far. The remaining work would be organised by direct communication from Klein and Lietzmann with the respective authors.

This message told at first the newest publication: it was the long prepared study on the development of mathematics instruction for girls at the secondary school level, with the main focus being on Northern Germany. It was written by Johannes Schröder; originally it was planned with Schimmack and his sister as authors – the only time that a female author was appearing and her name given in the typical contemporaneous form: "Fräulein Schimmack" (SUB Klein I, fol. 117). With this study, volume I was ready and was now printed with a postscript by Klein. And two more reports were almost ready. Thus, ten studies were still in preparation. One of them, the study by Katz on psychology and mathematics teaching, would be ready in about 1 month. Four of the ten reports would be ready this same year; for the others, however, no concrete data were given by their authors. Particularly delayed was Lorey's second book (see below).

This *Rundschreiben* stated that by finishing the outstanding reports, the work of the subcommission for the *Abhandlungen* would be completed. Further meetings were for the moment not envisaged. Yet, Klein opened a new series: its task was formulated here as "reporting in particular essays on the importance of the foreign IMUK reports for the German educational system". And the first such book planned was a study by Georg Wolff on the state of mathematics teaching in England. Actually, this initiative was due to Klein's dissatisfaction with the series of English reports: they were all written in such a hermetically closed form that they were only understandable to insiders. Thus, Klein sent Wolff as neutral "observer" to England to achieve an understandable report on the situation there.[7] A further such study was a book by A. Rohrberg on Denmark.

The works during the years from 1913 to 1916 can be assessed somewhat by the letters and postcards written by Klein to Lietzmann and complemented by Klein's letters and postcards to Lorey regarding his second book. The nearly 300 messages to Lietzmann, from 1908 onwards, constitute a highly significant documentation for Klein's working methods. In the interim, Klein wrote at least one message per week during this time to his secretary for the IMUK work, showing the enormous energy he invested: preparing meetings, inviting Lietzmann for conversations, asking him to write minutes or invitations, giving him advice in composing his reports and increasingly sharing the work of correcting the proofs for the various texts to be

[7] When I sent copies of this book in the 1970s to Geoffrey Howson and to Trevor Fletcher, both so highly knowledgeble of the British education system, they both highly admired the accurate and concise description and analysis of mathematics teaching in that complex system.

published by Teubner. One remarks as highly surprising the enormous efficiency of the mail services in this period – an immediate delivery, usually arriving the next day (SUB Lietz I, II, III).

7 Katz' Book on Psychology

This additional book in volume III had apparently been proposed only somewhere in 1912; in 1913, it was already published. Klein had commissioned David Katz (1884–1953) to expand this basic dimension for research into the learning of mathematics. The last editorial work for his book in June 1913 was effected in direct cooperation of Katz with Klein (SUB Lietz III, fol. 242). Having at first studied mathematics and the sciences at Göttingen University, Katz was thus already known to Klein. Katz changed to psychology and obtained his PhD and *habilitation* in psychology in Göttingen. Being later a psychology professor at Rostock University, he had to leave Germany in 1933, due to racial persecution by the Nazi regime. He continued his research in exile, in England and in Sweden.

There had already been earlier studies by psychologists on learning problems of children – for primary school grades – which focused on problems in number learning (see Schubring 2012). Katz developed a broader approach, aiming at providing insights into the process of learning mathematics based on experimental psychology for all levels of schooling. Furthermore, Katz reported extensively on research regarding the development of the number concept from early childhood on, in the "pre-conceptual stage" (Katz 1913, pp. 13–16). Thus, he was no longer fixed on children attending schools: his perspective was to study the development of the entire individual. In fact, he reported on his own studies with children aged 1.5 to 5 years (Katz 1913, p. 14). Moreover, Katz included studies about the development of spatial notions, which did not figure in earlier investigations, since geometry was used for a long time not to be a subject in primary schools.

8 Lorey's Book on the Institutional History of Mathematics

When WW I began in August 1914, five reports were not yet ready. There was one report among them, the second by Lorey, which had utmost importance for Klein, but its elaboration proved to be highly complicated.

As already outlined, Lorey's second book became projected due to the progress of his first book with which he was charged: to study the development of mathematics teacher education. It turned out that this implied two rather distinct dimensions: firstly, the development of the regulations for teacher exams and the practice of the exams and, secondly, the development of higher education mathematics in the various German states which essentially provided study courses for future teachers of mathematics. While the first book, on teacher formation – with focus on Prussia –

was published in 1911, the second book proved to be a real challenge. In 1909, when Klein "detected" Lorey, he was a mathematics teacher at Görlitz, in Eastern Prussia. In 1909, he became *Prorektor* at the *Oberrealschule* – part of the Gymnasium in Minden (Westphalia, Prussia). In 1912, he became director of the Public Commercial College (Öffentliche Handelslehranstalt) in Leipzig (Saxony) (see Schubring 1986).

Klein knew Lorey since he had finished his studies of mathematics at Göttingen and knew that he had some interest in the history of mathematics. But Lorey had no preparation at all in doing research on the history of mathematics or, specifically, on the institutional history of mathematics. Likewise, Klein did not have preparation in doing research on the history, but Klein had already initiated or accompanied various historical projects, like the edition of Gauß' works, based on his Nachlass. And Klein was then preparing his famous lectures on the history of mathematics in the nineteenth century. As the extensive correspondence between Klein and Lorey proves – 82 letters or postcards between 1909 and 1916 – Klein became not only Lorey's counsellor for this book, but he cooperated so intensely in composing the book that one could rightly call him the co-author.[8]

The first intense period in the cooperation between Klein and Lorey was the year 1911, with 11 letters, discussing the general lines and the details of the book on teacher education. Klein, pushing for getting all reports ready for the 1912 Congress, called Lorey to start the second work on March 19, 1911. Although staying in the sanatorium at Hahnenklee for most of 1912 due to health problems, he worked there 2 entire days with Lorey on the conception and first parts of the book. This original conception would analyse mathematics in higher education from 1870 on, hence the new German Reich. As the letters show, it was Klein who gave Lorey basic advice for historical research. For instance, Klein advised Lorey in January 1913 that to achieve substantial results, he had to consult the archives of the Prussian Education Ministry; he mediated him also to obtain access to the files regarding mathematics and mathematics professors which had not yet been handed over to the State Archives. Klein told Lietzmann on March 11, 1913, that Lorey had been granted access and noted later that Lorey had found there highly revealing material (SUB Lietz III, fol. 225/2). Assessing the approach so far pursued and the material obtained from archives and from interviews – a first form of "oral history" – Klein decided then that one could no longer restrict to the period from 1870 on. Instead, one had to consider the entire nineteenth century, i.e. since the establishment of proper mathematical study courses at universities. In a letter dated May 15, Klein drafted the new, extended structure of the book, with the new part focusing on the development of the mathematical seminars, the key form for practicing the research orientation – but the conception now included also the divergence between its Königsberg model and the Berlin one. 1913 constituted a first climax in the joint elaboration of the book, with 15 sometimes very long letters by Klein. There, Klein had expressed his wish to have the book ready by Easter (1914).

[8] Since quite a long time, I am working on a book about Lorey's life and work. There, this correspondence is edited. The book has as title *Wilhelm Lorey – Mathematikgeschichte unter der Ägide von Felix Klein*. This manuscript will be quoted here as "Schubring: Lorey".

1914 became the absolute climax, with 28 letters or cards. Already in January 1914, Klein wrote to have become impatient. In fact, besides the methodological problem, Lorey had taken a new position as director at the Leipzig College in 1912 and was intensely taken by his duties there and found very little time to dedicate to the book. Klein resolved he had to invest even more time himself for finishing the book. For the first book, Klein had already travelled to Lorey for conversations on text parts. Now, Klein reserved not only periods of 2 or 3 days to work personally with Lorey but even offered to put a fortnight at Lorey's disposal, in September 1914. Additionally, he was preoccupied by the war which might impede the completion of the IMUK reports. For this year, Klein even organised an assistant to help them both in writing and editing.

In 1915, Klein contracted a student to assist Lorey further in writing and editing. This year meant a still intense period in writing sections and paragraphs and in revising the general lines. But eventually, in the last of 16 letters, the day before Christmas, Klein could state that the book was practically achieved. In 1916, some editorial work with Teubner remained, but in October they were exchanging about the after-publication tasks: how to disseminate the book (Schubring: Lorey).

9 The Final 1916 Report

All the five volumes now being printed,[9] Gutzmer was able to publish a final report on the activities of the German subcommission. He did this in the series *Berichte und Mitteilungen*. The report is far from being a mere technical report; rather, it was composed with the passion of a dedicated participant of the entire, intense but ultimately successful endeavour.

In its first part, Gutzmer told about the origins of IMUK. In this view, Smith's initiative does not figure as the decisive instance. Rather, Gutzmer showed the increasing importance given to mathematics teaching from the first ICM in 1897. While absent at the first ICM, there had been a special section at the second ICM in 1900. For the third one, Gutzmer recalled several contributions. They reflected on the growing curricular reform movement in various countries, in particular in France, England, Italy, the United States and Germany. Given the numerous reports on these curricular reforms delivered at the Rome Congress, "the idea arose as if by itself" – according to Gutzmer – to create an international committee to study these developments (ibid., p. 332). Also, this report helps to address a question I had asked already quite a time ago, since there is no prior request by Smith to Klein, in their correspondence, for confirmation whether he would accept nomination: how could Smith nominate in Rome the absent Klein for the presidency? Actually, Smith had first proposed persons participating at the ICM: it reveals that he had proposed (one might imagine, just diplomatically) Gutzmer.

[9] The complete list of these *Abhandlungen* publications is given in Appendix II.

But Gutzmer denied, due to his obligations for DAMNU and proposed instead Klein as president (ibid.).

Reporting about the work of the German IMUK commission, Gutzmer mentions at first that the 5,000 marks provided by the Reich had secured financially the projected works – and more exactly by the reserve fund of the German Emperor – and another 5,000 marks by the Prussian Education Ministry. These same grants had been allotted again in 1912. Additional grants were given by the Prussian Commerce Ministry and the governments of Bavaria, Saxony, Baden and Hessen for studies concerning institutions in their realm (ibid., p. 335).

Gutzmer emphasised the importance of a number of study trips undertaken by the authors to assure competent information in their reports – an aspect hitherto not considered in the elaboration of the reports. He mentioned in particular visits of Lorey to almost all German universities, Lietzmann's visits of secondary schools in Prussia and Zühlke's visits of secondary schools in many German states to study the forms of teaching linear drawing. Many study trips were necessary for understanding the situation of mathematics instruction at primary schools in various states and of teacher training in seminars. It is noteworthy that the permission to visit such seminars by academics is mentioned especially. Here, he mentioned the travels of Wolff to England and of Rohrberg to Denmark (ibid., p. 337).

As a particularly fortuitous circumstance for the successful and innovative work has been emphasised by Gutzmer the fact that Felix Klein had acquired, before the founding of IMUK, a profound knowledge of the state of mathematics at universities and at secondary schools, due to his activities for the curricular reform movement and his participation in the various committees. By his efforts to calm the anti-mathematical movement of the engineers, he knew well the situation of applied mathematics at the technical colleges and the various technical schools – thus a profound familiarity, rarely to be found in a mathematician. Moreover, Klein showed a deep interest in key issues of contemporary educational policy: the mathematics instruction of girls and the overcoming of the deep social barriers between primary schools and secondary schools, along with the formation of their teachers (ibid., p. 338). Gutzmer called attention to the enormous discrepancy between the various levels of education, thus denouncing the rather exclusive attention devoted so far to secondary schools: he confronted the estimated ten million children at German primary schools with the nearly 400,000 boys and girls in secondary schools and only about 50,000 students in higher education. An analogous discrepancy existed between the number of teachers: about 150,000 at primary schools compared with about 15,000 at secondary schools and only ca. 2,000 at universities (ibid., p. 340).

Having set the context, Gutzmer proceeded to describe the elaboration of the programme for the reports and then the development of the process of writing and revising the reports themselves, basically in chronological order. This description evidences, again, the cooperative and collective character of the elaboration. Thus, the enormous dedication of Klein to achieve this complex task is evidenced. In 1909, his summer vacation on Langeoog, an island in the North Sea, turned into an intensive working session. Apparently by chance, he got to know Timerding there and detected him as a competent author for issues of teaching mathematics in applied contexts. Klein decided to use the summer term of 1910 as a sabbatical in order concentrate on promoting the elaboration of the reports by the various authors. The high degree of exhaustion due to his too extended activities forced Klein to stay from autumn 1911 until October of 1912 in the already mentioned sanatorium at Hahnenklee in the Harz mountains, not too far from Göttingen. While recovering, he continued intensely in promoting the finishing of the German IMUK reports. Once he returned from Hahnenklee, Klein asked the Ministry to be disburdened from his teaching obligations (to become an *Emeritus*), to focus entirely on his work for IMUK, for DAMNU and for the *Enzyklopädie der mathematischen Wissenschaften* (ibid., p. 345, 347).

Thanks to Gutzmer's report, one knows more about the year 1912 where the minutes of the German IMUK meetings are missing. In particular, one learns about the preparations for the Cambridge Congress; Smith stayed there for a period. There was even a meeting of the CC, which decided to ask the congress to extend the mandate of IMUK, due to the not yet finished works (ibid., p. 345).

One even learns from Gutzmer's report details which characterise vividly the intense nature of the cooperative work: the waiting room of the train station at Halle/Saale, a traffic junction of several major train connections, turned to serve, for an extended period, as consultation room where Klein and Gutzmer and other collaborators and assistants used to deliberate for hours. When the time there was not sufficient, Gutzmer might accompany Klein in the train until Nordhausen (in the direction of Göttingen) to continue the deliberations. Also Gutzmer for his part frequently used the waiting room in the same way, to work with Dreßler and Körner, authors of reports on primary school issues (ibid., p. 350).

All in all, Gutzmer ends his report highly satisfied with this demanding but innovative work. Due to the war, he was sceptical about the impact outside of Germany but was highly convinced of important impact within Germany regarding the continuation of the reform of mathematics teaching at all levels.

Given the state support for the work of the German IMUK commission, Klein sent the complete set of the *Abhandlungen* to the German Emperor (StB Gö I).

10 The Dissolution of IMUK 1918/20 and the Aftermath

When WW I began, it was generally understood that the international cooperation, so characteristic of the IMUK work, could not be continued. This was first understood as an interruption, not as its end. Soon, however, and pushed by the IMUK general secretary Fehr, it became clear that IMUK could not continue, even after the war and that IMUK had to be dissolved (Schubring 2008, p. 15 ff.). In fact, in July 1920, Fehr published the dissolution of IMUK. However, it had been agreed that the national subcommissions could continue to work (ibid., p. 27).

Lietzmann communicated this situation for the German public in the journal ZfmnU whose editor he had become, in 1914. He emphasised in particular the possibility to continue the work on a national level. And he reported that the German subcommission had decided to continue. This decision had been communicated to the competent government instances and had been approved by them. The functionality had been confirmed by the nomination of two members, replacing two members who died: Stäckel and Thaer. The new members were Rudolf Rothe (1873–1942), an applied mathematician from Berlin University, and Lietzmann. As secretary, Georg Wolff, mathematics teacher and the successful reporter on mathematics teaching in England, had been nominated. Klein continued as president (Lietzmann 1921, p. 33).

After Klein's death in 1925, no successor was elected as president of the German subcommission. The DMV seems to have lost sight of this activity.

It was only early in 1932 that Ludwig Bieberbach detected this issue, in the wake of the next ICM, in Zürich in September 1932. He corresponded with Lietzmann about the subcommission and alerted the directorate of the DMV. The DMV then nominated two new members, Otto Toeplitz, mathematics professor at Bonn University, and Georg Hamel, mathematician at the Technical University Berlin and president of the *Mathematische Reichsverband*, an association of various mathematical associations. Still practicing the connection of IMUK affairs with the government, Hamel asked Lietzmann to transmit these nominations to the government, and the *Reich* Ministry of the Interior, in agreement with the Ministry of Foreign Affairs and the Prussian Education Ministry, agreed with this "Zuwahl" or co-optation. Yet, there were conflicts and confusion among the now five members, since it had not become clear who of them should be the three delegates for ICMI. Eventually, Toeplitz felt forced to resign in June 1933, due to his racial persecution by the Nazi regime (StB Gö II).

At the IMUK meeting in Zürich, an international report on the state of mathematics teacher formation was on the agenda. In fact, this last international thematic study was not achieved by the first IMUK due to WW I. In 1915, a German report had already been prepared by Lietzmann, Wernicke and Timerding (StB Gö I). Yet, Hamel took the initiative to report in Zürich in 1932 about the German situation, without using this earlier material and without coordinating with the other members of the subcommission (see *L'Enseignement Mathématique*, 1932, 31, p. 261).

In January 1936, the *Reichsminister* of the Interior confirmed as members of the German subcommission Hamel, Lietzmann and Georg Feigl, professor at Breslau university – both Hamel and Feigl being allied to Nazism. Lietzmann, being the coordinator, earned a highly unsuccessful task: the Ministry charged him in March 1936 to be the leader of the German participants at the ICM in Oslo in August 1936. Due to the foreign exchange control established by Germany, potential participants had to be approved by the government and Lietzmann had to mediate these deliberations where several interested persons were refused (StB Gö III).

The revived IMUK had decided in 1932 that national reports on recent trends in mathematics instruction should be given at the 1936 Congress. It was Lietzmann this time who authored this report – after his draft had been overseen by Hamel (ibid.).

11 An Outlook After WW II

After the stagnation during World War II and in the subsequent years, IMUK was refounded as ICMI, now no longer a committee of the ICM but of the organisation IMU. There, the continuation of national subcommittees was confirmed. The first secretary general became Heinrich Behnke,[10] mathematics professor at Münster University and highly dedicated to the legacy of Klein and to teacher education as the genuine goal of mathematical studies at universities. Here, a new series of national reports was inaugurated. Behnke organised the German contribution by the (West-)German subcommission: first on the state of mathematics teaching for 16- to 21-year-old students and then a second series – *Der mathematische Unterricht für die sechs- bis fünfzehn-jährige Jugend in der Bundesrepublik Deutschland*.

12 Concluding Remarks

Without doubt, the results of the work of the German IMUK subcommission are not only profoundly impressive, but they also constitute the best achievements among the various national subcommissions. The reports succeeded in giving a rather complete view of mathematics teaching, not only at the typical school levels but extended to broad range of institutions where mathematics was taught as a service subject for some application or technical discipline. Contrary to most of the other countries, the higher education institutions were included, too. The distinctive feature was, however, to have extended the work beyond the genuine reports on the state of instruction to address thematic issues of mathematics education. Achieving this broad and innovative range can be rightly attributed to the far-sighted conceptions of Felix Klein.

As practically in all other active countries, the devastative effects of WW I did not allow the activities to continue in any comparable manner; after the war, there remained only some feeble structures and initiatives.

[10] Behnke continued to use “IMUK”.

Appendix I: The Agenda for the Brussels IMUK Meeting[11]

Mittwoch, den 10. August, vorm. 9 Uhr, in der Salle Ravenstein, Rue Ravenstein 3, nahe der Place Royale. Sitzung der Delegierten und der Mitglieder der Unterkommissionen.

Tagesordnung:
1. Begrüssungsansprache des Vorsitzenden.
2. Stand der Arbeiten in den verschiedenen Ländern; Vorlegung von bereits fertiggestellten Berichten.
3. Allgemeine Diskussion über die Organisation der Arbeiten.
4. Vorschlag für eine Sitzung im Jahre 1911.

Mittwoch, den 10. August, 4 Uhr nachm., in der Salle Ravenstein, Rue Ravenstein 3, nahe der Place Royale. Oeffentliche Versammlung.

Tagesordnung:
1. Begrüssung durch einen Vertreter Belgiens.
2. Ansprache von F. Klein: Ueber die Aufgabe der Kommission und den Unterricht im allgemeinen.
3. H. Fehr: Kurzer Bericht über den Stand der Arbeiten in den verschiedenen Ländern.
4. C. Bourlet: Sur la pénétration réciproque des mathématiques pures et des mathématiques appliquées dans l'enseignement secondaire.

4. Tagesordnung für die am 11. und 12. August in der Deutschen Unterrichts-Ausstellung in Brüssel stattfindenden, vom Verein zur Förderung des mathematischen und naturwissenschaftlichen Unterrichts veranstalteten mathematisch-naturwissenschaftliche Demonstrationen. (Nach den Angaben des Vereinsvorsitzenden, Herrn Direktor A. Thaer, Hamburg):

11. August	10 Uhr vorm.:	Begrüssungen.	
	10¼ " " :	Treutlein:	Ueber geometrischen Anschauungsunterricht.
	11 " " :	Grimsehl:	Physikalische Schülerübungen an der Oberrealschule a. d. Uhlenhorst in Hamburg.
	11¾ " " :	Schoenichen:	Selbsttätigkeit der Schüler im naturkundlichen Unterricht. Orientierung über die biologische Ausstellung.

[11] SUB Klein I, fol.s 112–113. The evening before: Welcome address, 20:30, in Brasserie aux trois Suisses.

11. August	4 Uhr nachm.:	Grimsehl:	Physikalische Demonstrationen.
	4 3/4 " " :	Schoenichen:	Führung durch die biologische Ausstellung.
	6 " " :	Driesen:	Bilder aus dem Schulleben einer deutschen Grossstadt (Charlottenburg). Kinematographisch, grammophonisch.
12. August	10 Uhr vorm. :	Schwering:	Ist Mathematik Hexerei ?
	10 3/4 " " :	Poske:	Vortrag und Orientierung über die physikalische Ausstellung.
	11½ " " :	B.Schmid:	Die Entwicklung des biologischen Unterrichts, seine Ziele und sein gegenwärtiger Betrieb.
	4 " nachm.:	Treutlein:	Führung durch die mathematische Ausstellung.
	4½ " " :	Poske und Mosch:	Führung durch die physikalische Ausstellung.
	5½ " " :	B.Schmid:	Kinematographische Vorführung biologischer Schülerübungen.

5. Ueber die von französischer und belgischer Seite geplanten Unterrichtskonferenzen lassen sich genauere Angaben über Tagesordnung und dergl. noch nicht machen. In der französischen Unterrichtsausstellung werden Vorträge und Demonstrationen wahrscheinlich am 13. und 14. August stattfinden. Auf belgischer Seite ist Veranstalterin die „Fédération de l'Enseignement moyen officiel de Belgique". Der von dieser Vereinigung in Aussicht genommene „Congrès international de l'Enseignement moyen" wird am 15. und 16. August stattfinden; Anfragen sind an den Generalsekretär V. Wittmann (Prof. d'Athénée, rue Neuve à Genval, Brabant) zu richten.

Appendix II: The German IMUK Publications[12]

SOUS-COMMISSIONS NATIONALES

ALLEMAGNE

Les travaux de la Sous-commission allemande comprennent dix volumes gr. in-8° (brochés M. 133.—, reliés M. 153.—. B. G. Teubner, Leipzig) et constituent en quelque sorte une encyclopédie de l'enseignement mathématique en Allemagne. Ils ont été répartis en deux séries : A. *Abhandlungen;* B. *Berichte u. Mitteilungen.*

A. *Abhandlungen* über den mathematischen Unterricht in Deutschland, veranlasst durch die Internationale Mathematische Unterrichtskommission. Hrsg. von F. Klein. 5 Bände, bzw. 9 Teilbände, in einzeln käuflichen Heften. gr. 8. 1909-1916. Geh. M. 113.—, geb. M. 131.—.

I. Band. Die höheren Schulen in Norddeutschland. (Heft 1-5) 1913. Geh. M. 16.—, geb. M. 18.—.

12. 1. Lietzmann, W., Stoff und Methode im mathematischen Unterricht der norddeutschen höheren Schulen. Mit einem Einführungswort zu Band I von F. Klein. (XII u. 102 S.) 1909. M. 2.—.

13. 2. Lietzmann, W., Die Organisation des mathematischen Unterrichts an den höheren Knabenschulen in Preussen. Mit 18 Fig. (VIII u. 204 S.) 1910. M. 5.—.

14. 3. Lorey, W., Staatsprüfung und praktische Ausbildung der Mathematiker an den höheren Schulen in Preussen und in einigen norddeutschen Staaten. (VI u. 118 S.) 1911. M. 3.20.

15. 4. Thaer, A., Geuther, N., Böttger, A., Der mathematische Unterricht an den Gymnasien und Realanstalten der Hansestädte, Mecklenburgs und Oldenburgs. (VI u. 93 S.) 1911. M. 2.—.

16. 5. Schröder, J., Die neuzeitliche Entwicklung des mathematischen Unterrichts an den höheren Mädchenschulen Deutschlands, insbes. Norddeutschlands. Mit Schlusswort zu Band I von F. Klein. (XII u. 183 S.) 1913. M. 6.—.

[12] Source: *L'Enseignement Mathématique*, vol. 21, 1920/21, pp. 321–324.

322 *COMMISSION INTERNATIONALE*

II. Band. Die höheren Schulen in Süd- und Mitteldeutschland. (Heft 1-8) 1913. Geh. M. 12.—, geb. M. 14.—.

17. 1. Wieleitner, H., Der mathem. Unterricht an den höh. Lehranstalten, sowie Ausbildung und Fortbildung der Lehrkräfte im Königreich Bayern. Mit einem Einführungswort zu Bd. II von P. Treutlein. (XIV u. 85 S.) 1910. M. 2.40.

18. 2. Witting, A., Der mathematische Unterricht an den Gymnasien und Realanstalten nach Organisation, Lehrstoff und Lehrverfahren und die Ausbildung der Lehramtskandidaten im Königreich Sachsen. (XII u. 78 S.) 1910. M. 2.20.

19. 3. Geck, E., Der mathematische Unterricht an den höheren Schulen nach Organisation, Lehrstoff und Lehrverfahren und die Ausbildung der Lehramtskandidaten im Königreich Württemberg. (IV u. 104 S.) 1910. M. 2.60.

20. 4. Cramer, H., Der mathematische Unterricht an den höheren Schulen nach Organisation, Lehrstoff und Lehrverfahren und die Ausbildung der Lehramtskandidaten im Grossherzogtum Baden. (IV u. 48 S.) 1910. M. 1.60.

21. 5. Schnell, H., Der mathematische Unterricht an den höheren Schulen nach Organisation, Lehrstoff und Lehrverfahren und die Ausbildung der Lehramtskandidaten im Grossherzogtum Hessen. (VI u. 51 S.) 1910. M. 1.60.

22. 6. Hossfeld, C., Der mathematische Unterricht an den höheren Schulen Thüringens. (IV u. 18 S.) 1912. M. —.80.

23. 7. Wirz, J., Der mathematische Unterricht an den höheren Knabenschulen, sowie die Ausbildung der Lehramtskandidaten in Elsass-Lothringen. (VI u. 58 S.) 1911. M. 1.80.

24. 8. Lietzmann, W., Geck, E., Cramer, H., Neue Erlasse in Bayern, Württemberg u. Baden. Mit Schlusswort zu Bd. II von A. Thaer. (49 S.) 1913, M. 1.50.

III. Band. Einzelfragen des höheren mathematischen Unterrichts. (Heft 1-9 in 3 Teilbänden) 1915/16.

Erster Teilband (Heft 1-5). Geh. M. 10. —, geb. M. 12.—.

25. 1. Schimmack, R., Die Entwicklung d. mathemat. Unterrichtsreform in Deutschland. Mit Einführungswort zu Bd. III von F. Klein. (VI u. 146 S.) 1911. M. 3.60.

26. 2. Timerding, H. E., Die Mathematik in den physikalischen Lehrbüchern. (VI u. 112 S.) 1910. M. 2.80.

27. 3. Zühlke, P., Der Unterricht im Linearzeichnen und in der darstellenden Geometrie an den deutschen Realanstalten. (IV u. 92 S.) 1911. M. 2.60.

28. 4. Hoffmann, B., Mathematische Himmelskunde und niedere Geodäsie an den höheren Schulen. (VI u. 68 S.) 1912. M. 2.—.

29. 5. Timerding, H. E., Die kaufmännischen Aufgaben im mathematischen Unterricht der höheren Schulen. (IV u. 45 S.) 1911. M. 1.60.

Zweiter Teilband. 1. Abteilung (Heft 6-8). Geh. M. 10.—, geb. M. 12.—.

30. 6. Gebhardt, M., Geschichte der Mathematik im mathematischen Unterricht an den höheren Schulen Deutschlands. Dargelegt auf Grund alter und neuer Lehrbücher und der Programmabhandlungen höherer Schulen. (VII u. 157 S.) 1912. M. 4.80.

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31. 7. Wernicke, A., Mathematik und philosophische Propädeutik. (VII u. 138 S.) 1912, M. 4.—.

32. 8. Katz, D., Psychologie und mathematischer Unterricht. (IV u. 120 S.) 1913. M. 3.20.

Zweiter Teilband. 2. Abteilung (Heft 9). Geh. M. 12.—, geb. M. 14.—.

33. 9. Lorey, W., Das Studium der Mathematik an den deutschen Universitäten seit Anfang des 19. Jahrhunderts. Mit einem Schlusswort zu Band III von F. Klein. (XVI u. 440 S.) 1916. Geh. M. 12.—, geb. M. 14.—.

IV. Band. Die Mathematik an den technischen Schulen. (Heft 1-9 in 2 Teilbänden) 1915/16.

Erster Teilband (Heft 1-4). Geh. M. 14.—, geb. M. 16.—.

34. 1. Grünbaum, H., Der mathematische Unterricht an den deutschen mittleren Fachschulen der Maschinenindustrie. Mit einem Einführungswort zu Band IV von P. Stäckel. (XVI u. 100 S.) 1910. M. 2.60.

35. 2. Ott, C., Die angewandte Mathematik an den deutschen mittleren Fachschulen der Maschinenindustrie. (IV u. 164 S.) 1913. M. 4.—.

36. 3. Girndt, M., Die deutschen bautechnischen Fachschulen und der mathematische Unterricht. (VI u. 232 S.) 1916. M. 7.20.

37. 4. Schilling, C., und Meldau, H., Der mathematische Unterricht an den deutschen Navigationsschulen. (VI u. 82 S.) 1912. M. 2.—.

Zweiter Teilband (Heft 5-9). Geh. M. 17.—, geb. M. 19.—.

38. 5. Trost, W., Die mathematischen Fächer an den niederen gewerblichen Lehranstalten in Deutschland. (VI u. 150 S.) 1914. M. 4.—.

39. 6. Penndorf, B., Rechnen und Mathematik im Unterricht der kaufmännischen Lehranstalten. (IV u. 100 S.) 1912. M. 3.—.

40. 7. Jahnke, E., Die Mathematik an Hochschulen für besondere Fachgebiete. (VI u. 56 S.) 1911. M. 1.80.

41. 8. Furtwängler, Ph., und Ruhm, G., Die mathematische Ausbildung der deutschen Landmesser. (VI u. 50 S.) 1914. M. 1.60.

42. 9. Stäckel, P., Die mathematische Ausbildung der Architekten, Chemiker und Ingenieure an den deutschen technischen Hochschulen. Mit einem Schlusswort zu Band IV von P. Stäckel. (XIV u. 195 S.) 1915. M. 6.80.

V. Band. Der mathematische Elementarunterricht und die Mathematik an den Lehrerbildungsanstalten. (Heft 1-7 in 2 Teilbänden) 1916.

Erster Teilband (Heft 1-4.) Geh. M. 13.—, geb. M. 15.—.

43. 1. Lietzmann, W., Stoff und Methode des Rechenunterrichts in Deutschland. Ein Literaturbericht. Mit einem Einführungswort zu Bd. V von F. Klein. (VII u. 125 S.) 1912. M. 3.—.

44. 2. Lietzmann, W., Stoff und Methode des Raumlehrunterrichts in Deutschland. Ein Literaturbericht. (IV u. 88 S.) 1912. M- 2.80.

45. 3. Der mathematische Unterricht an den Volksschulen und Lehrerbildungsanstalten in Süddeutschland, mit Ausführungen von E. Hensing über Hessen, H. Cramer über Baden, E. Geck über Württemberg, G. Kerschensteiner und A. Bock über Bayern. Mit einem Einführungswort von P. Treutlein. (XIV u. 163 S.) 1912. M. 5.—.

46. 4. Dressler, H., und Körner, K., Der mathematische Unterricht an den

Volksschulen und Lehrerbildungsanstalten in Sachsen, Thüringen und Anhalt. (V u. 132 S.) 1914. M. 4.80.

Zweiter Teilband (Heft 5-7). Geh. M. 9.—, geb. M. 11.—.

47. 5. UMLAUF, K., Der mathematische Unterricht an den Seminaren und Volksschulen der Hansestädte. (VII u. 165 S.) 1915. M. 4.80.

48. 6. LIETZMANN, W., Die Organisation des mathematischen Unterrichts an den preussischen Volks- und Mittelschulen. (VI u. 106 S.) 1914. M. 3.—.

49. 7. KÖRNER, K., Die Mathematik im preussischen Lehrerbildungswesen. Mit einem Schlusswort zu Bd. V von F. KLEIN. (VIII u. 136 S. 1916. M. 4 —.

B. *Berichte und Mitteilungen*, veranlasst durch die Internationale Mathematische Unterrichtskommission. Herausgegeben von W. LIETZMANN. 2 Folgen in 1 Bande. I. Folge: Heft I-XII. 1909-1916. II. Folge: Heft I-III. 1915-1917. (357 u. 377 S.) gr. 8. 1917. Geh. n. M. 20.—, geb. n. M. 22.—. Auch einzeln.

Erste Folge:

50. I. FEHR, H., Vorbericht über Organisation und Arbeitsplan der Kommission. Deutsche Uebersetzung von W. LIETZMANN. (S. 1-10.) 1909. M. 30.—

51. II. NOODT, G., Über die Stellung der Mathematik im Lehrplan der höheren Mädchenschulen vor und nach der Neuordnung des höheren Mädchenschulwesens in Preussen. (S. 11-32.) 1909. M.—.80.

52. III. KLEIN, F., und FEHR, H., Erstes Rundschreiben des Hauptausschusses. Deutsch bearbeitet von W. LIETZMANN. (S. 33-38.) 1909. M.—.20.

53. IV. KLEIN, F., und FEHR, H., Zweites Rundschreiben des Hauptausschusses. Deutsch bearbeitet von W. LIETZMANN. — ZÜHLKE, P., Mathematiker und Zeichenlehrer im Linearzeichenunterricht der preussischen Realschulen. (S. 39-54.) 1910. M. —.50.

54. V. LIETZMANN, W., Die Versammlung in Brüssel. Nach dem von H. FEHR verfassten dritten Rundschreiben des Hauptausschusses. (S. 55-74.) 1911. M. —.60.

55. VI. FEHR, H., Viertes Rundschreiben des Hauptausschusses. Deutsch bearbeitet von W. LIETZMANN. (S. 75-88.) 1911. M. —.50.

56. VII. LIETZMANN, W., Der Kongress in Mailand vom 18. bis 20. September 1911. — SCHIMMACK, R., Über die Verschmelzung verschiedener Zweige des mathematischen Unterrichts. (S. 89-126.) 1912. M. 1.60.

57. VIII. STÄCKEL, P., Nachruf auf Peter Treutlein. — LIETZMANN, W., Der Internationale Mathematikerkongress in Cambridge. (S. 129-186.) 1913. M. 1.60.

58. IX. DRESSLER, H., Mathematische Lehrmittelsammlungen, insbesondere für höhere Schulen. (S. 187–217.) 1913. M. 1.—

59. X. WEINREICH, H., Die Fortschritte der mathematischen Unterrichtsreform in Deutschland seit 1910. — LIETZMANN, W., Der Pariser Kongress der Internationalen Mathematischen Unterrichtskommission vom 1.-4. April 1914. (S. 219-310.) 1915. M. 3.—.

References

Sources

Niedersächsische Staats- und Universitätsbibliothek Göttingen, Handschriftenabteilung:
Nachlass Felix Klein, Cod. Ms. F. Klein

- 44. Pädagogische Korrespondenz 1908–1913. SUB Klein I
- 51. Pädagogische Korrespondenz 1910–1921. SUB Klein II

Nachlass Walther Lietzmann, Cod. Ms. Walther Lietzmann

- Briefe Klein an Lietzmann, 1–100 (1908–1911). SUB Lietz I
- Briefe Klein an Lietzmann, 101–200 (1911/12). SUB Lietz II
- Briefe Klein an Lietzmann, 201–310 (1912–1919). SUB Lietz III

Stadtbibliothek Göttingen
Nachlass Walther Lietzmann:

- B 2. Sitzung der IMUK in Paris 1914 [StB Gö I]
- B 5. IMUK StB Gö II]
- C 4. Kongreß in Oslo, 1936 [stB Gö III]

Publications

Behm, Hans Wolfgang. 1912. Hans Treutlein. *Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht* 43: 521–530.

Gutzmer, August. 1912. The Work Done by the German Subcommittee on the Teaching of Mathematics. *Science*, *New Series* 36(937): 818–820.

Gutzmer, August. 1916. Bericht anlässlich der Fertigstellung der "Abhandlungen". In *Berichte und Mitteilungen, veranlasst durch die Internationale Mathematische Unterrichtskommission*, 1. Folge, Heft 12, ed. Walter Lietzmann, 331–357. Leipzig: Teubner.

Katz, David. 1913. *Psychologie und Mathematischer Unterricht*. Abhandlungen über den mathematischen Unterricht in Deutschland. Band III, Heft 2. Leipzig: Teubner.

Lietzmann, Walther. 1908. Die Grundlagen der Geometrie im Unterricht (mit besonderer Berücksichtigung der Schulen Italiens). *Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht* 39: 177–195.

Lietzmann, Walther. 1921. Die internationale mathematische Unterrichtskommission. *Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht* 53: 31–33.

Schubring, Gert. 1986. Wilhelm Lorey (1873–1955) und die Methoden mathematik-geschichtlicher Forschung. *Mathematica didactica* 9: 75–87.

Schubring, Gert. 1989. Pure and Applied Mathematics in Divergent Institutional Settings in Germany: the Role and Impact of Felix Klein. In *The History of Modern Mathematics. Volume II: Institutions and Applications* eds. David Rowe, John McCleary, 171–220. Boston: Academic Press.

Schubring, Gert. 2008. The Origins and the Early History of ICMI. *International Journal for the History of Mathematics Education* 3(2): 3–33.

Schubring, Gert. 2012. 'Experimental pedagogy' in Germany – a case study in searching for the roots of PME. *Research in Mathematics Education* 14 (3): 221–235.

Schubring, Gert. 2016. "Die Entwicklung der Mathematikdidaktik in Deutschland". *Mathematische Semesterberichte* 63(1): 3–18.

Schubring, Gert [Schubring: Lorey]. *Wilhelm Lorey – Mathematikgeschichte unter der Ägide von Felix Klein*. Book manuscript.

Chapter 4
The British National Subcommission of ICMI and the Mathematics Education Reform

Leo Rogers

Abstract This chapter will focus on the British National Subcommission of the International Commission on Mathematical Instruction. Reforms in the teaching of mathematics had been discussed in Britain since the second half of the nineteenth century, and the work of the International Commission stimulated these discussions. The beginning of the chapter addresses the period prior to 1908 and certain important organisational steps and figures of that time. This is the background against which the Subcommission began its work. The chapter then analyses some of the Subcommission's publications and publications concerning the International Commission and also tells about certain important figures of the Subcommission and, more broadly, of the reform movement.

Keywords Subcommission · Reports · Board of Education · Examinations · Curriculum · Practical mathematics · Public schools · Euclid

1 Introduction

This chapter will discuss the British Subcommission of the International Commission, mainly focusing, on the one hand, on the Subcommission's publications – its reports – and on the other hand, on the biographies of its members. In order to understand what took place, however, one must begin the account somewhat earlier than 1908, when the International Commission was formed, and to delineate certain distinctive characteristics of the British education system and reform movement, which began to take shape already in the nineteenth century.

Without going into a discussion of the whole British system of mathematics education during the Victorian era (see Flood et al. 2011; Howson and Rogers 2014; Mehrtens et al. 1981; Price 1983; Rogers 1981), we should note a certain degree of conservatism in the contents of education – above all, in the role played by the study

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of geometry and in the manner in which this study was carried out. Felix Klein (2016, p. 243) contrasts the situation in England with that of Germany and remarks that "England has had the longest time under the spell of Euclid" which is due to the strange system of strictly centralised examinations which is only possible if there is a "standard work" that every examinee knows and on which the questions can be based. This was the Elements of Euclid. Having schoolboys learn the theorems and proofs by heart meant that they learnt the words of Euclid but never understood the meaning. Many school teachers wanted to change the situation but were prevented by the rigid examination system. They were unable to think of any alternative, and to replace what they did by habit would end in chaos. In schools, syllabuses for both arithmetic and algebra had not moved on since the eighteenth century. Many teachers were not well trained in mathematics and had no idea what to do.

It should be noted that, despite all of the country's successes in the practical sphere – industrialisation – or perhaps precisely because of these successes, over the course of the entire nineteenth century the chief criticism levelled at the universities was that their neglect of science meant they could contribute very little to the practical needs of industrialisation.

The special role of exams in the organisation of the contents of education has already been mentioned. Britain was also distinguished from many other countries by the role played in the changes in its education by all kinds of public associations and commissions (Lockwood 1967). Meanwhile, the British government was slowly beginning to wake up to the fact that the education system needed urgent reorganisation. Calls for reorganisation became increasingly urgent at the end of the nineteenth century.

2 The Period Until 1908

Below, we note certain important organisational changes that impacted the subsequent development of education, and we also discuss certain influential figures in mathematics education.

2.1 Board of Education Origins in 1899

In the UK parliament, in April 1883, politicians discussed the creation of a Ministry of Education. When the subject was debated in the Commons later that year, Gladstone, the Prime Minister, "publicly disparaged the proposed change", and it was rumoured that "the real objection [to a minister of education] probably was, that it was undesirable to make too much of education, that if we were to have a Minister of Education he might be pushing things on too quickly" (Gillard 2018). Although the proposal for a minister of education was not adopted, two changes were made: a separate secretary was appointed for the Science and Arts Department at South

Kensington and the administration of education in Scotland was finally separated from that of England. Education Policy had, until this time, been decided by the Committee of the Privy Council on Education, 1839–1899 and later, jointly by the Education Department, 1856–1899. Finally, in 1899 an Act of Parliament established the *Board of Education* as the government department responsible for education, replacing the Education Department and the Department of Science and Art. This created, for the first time, a single central authority for education in England and Wales.[1]

This Act empowered the Board:

- To create a registry of teachers.
- To inspect secondary schools and to advise on educational matters.
- To inspect any school supplying *secondary education* (not distinguished from technical education) for the purpose of ascertaining the character of the teaching in the school, the provisions made for the teaching, and health of the scholars.
- To require any Local Authority to pay or contribute to the expenses of inspecting any school within their county or borough.
- The Board would also periodically distribute "circulars" that were intended to offer "guidance" on curriculum matters and teaching methods (Gillard 2018).

Later, the Board became the sole organisation that published the Subcommission's reports.

2.2 Rawdon Levett and the Association for the Improvement of Geometrical Teaching

Changes in both the contents of education and in the organisation of the mathematics community were in no small part connected with Rawdon Levett (see Mayo and Godfrey 1923). He had graduated as 11th Wrangler[2] from St John's College, Cambridge, in 1865; he taught for a short time at Rossall School[3] and then became a Mathematical Master at King Edward's Grammar School,[4] Birmingham, in 1869. Taking advantage of the introduction of mathematics into the school programme, Levett arranged that all the work beyond arithmetic was done by himself, and he

[1] The education system for Scotland was entirely separate (Rogers 2011).

[2] "Wrangler" was the term for those who achieved top marks in the "Tripos", the final examinations at Cambridge University at that time. The highest-scoring student is the Senior Wrangler, the second highest is the Second Wrangler, and so on.

[3] Rossall School (Lancashire) was founded in 1844 to "provide a classical, mathematical and general education of the highest class" and was part of the early Victorian expansion of the top public schools in the UK.

[4] King Edward's Grammar School gained its original charter and endowment from King Edward VI in 1552. In 1835 a new Headmaster expanded the curriculum to include mathematics and science as well as classics.

began to initiate the boys into algebra and geometry. He believed mathematics was an instrument destined to uplift the educational standard of all schoolwork. Having introduced geometry, he was naturally frustrated that the traditional system admitted only a strict order of Euclid's theorems in the geometry textbook, and examiners insisted that boys learnt the theorems by heart, to repeat them "parrot-fashion" in the examination.

At university, Levett had become acquainted with mathematical works from abroad and with the methods of non-Euclidean geometry and contemporary analysis. One can understand how frustrating it was, to be told to limit his pupils' learning to a rigid discipline that distorted the science and dulled the mind. *Euclid's Elements* was not intended to be a textbook for use by pupils but a detailed syllabus of proofs leading to the logical exposition of geometrical ideas.

The compulsory use of Euclid as a textbook of geometry was, not surprisingly, marring the teaching of mathematics generally and consequently also that of science. This became recognised in the *British Association for the Advancement of Science* (BAAS), which set up a committee to study the matter. Correspondence ensued in the *Educational Times*,[5] and on 26 May 1870, the new journal *Nature* printed a letter urging the formation of an "Anti-Euclid Association".

Levett, although comparatively new to school teaching, had taken the initiative to suggest the formation of this new Association whereby one of its objectives would "induce examining bodies to frame their questions in Geometry without reference to any particular textbook". A good deal of private correspondence followed, and in October a decision was taken to call a meeting in the following January.

A final advertisement of the January meeting appeared in *Nature* for 29 December 1870. It was signed by Wilson (Senior Mathematical Master at Rugby[6]), Rawdon Levett, MacCarthy (Levett's second Master at Birmingham), and R. Tucker who was Mathematical Master at the University College School, London, and at that time the Secretary of the *London Mathematical Society* which had been founded in 1865. The meeting was duly held on 17 January 1871. There were 26 members present, which suggests that "membership" had been instituted in the autumn of 1870; they were nearly all Schoolmasters; a few other "interested gentlemen" were there as well. The chair was taken by Dr. T. A. Hirst, FRS, who had been a prime mover in the founding of the *London Mathematical Society*. At the time of the meeting, he was Assistant Registrar to *London University*, but until shortly before he had been a professor of mathematics at *University College, London* where the meeting was held. The meeting adopted the title of *the Association for the Improvement of Geometrical Teaching* (AIGT); Hirst was elected President and Levett and MacCarthy Secretaries. A formal constitution was not adopted until 1882. The Report of this first meeting lists 61 members, of whom over 50 were Schoolmasters.

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[5] The journal *Educational Times* was founded in 1847 and had a specific Mathematics section where current matters were discussed.

[6] Rugby was one of the nine "great" public schools.

General dissatisfaction with the textbook situation was broad enough, so that in December 1870 when the Head Masters' Conference met at Sherborne, and the 34 members passed a resolution, but only to the effect "that the Government, the Universities and other examining bodies should be communicated with for the purpose of inducing them to allow greater latitude in the use of geometrical text-books".

The battle to change the system and relax the dominance of Euclid took a long time. Teachers who had become used to training pupils to memorise theorems were unable to think of any alternative, and this, together with the fact that the overwhelming majority were poorly trained, meant that there was general consternation and inability to see that there was any alternative. If Euclid was removed, how could they train their pupils to pass the examinations? For the university professors, who decided on the regulations for the examinations, they had no experience of teaching schoolboys: Euclid was the ideal of pure geometry. For the examiners, who marked the papers, changing the geometry textbook would make their life difficult. Which book(s) should they use as a guide?

Progress was slow, and discussion about how radical changes would be organised, and what modifications might be allowed, was difficult. The AIGT published a provisional syllabus for the teaching of geometry in 1875 and approached various university examining bodies without any positive result. The opinion had been expressed that excellent work might be done if the Association would draw up a pamphlet or series of pamphlets on methods of teaching geometry.

The Sixth General Meeting of the AIGT was held at University College, London on 11 January 1878. (See Association for the Improvement of Geometrical Teaching 1878.)

Thomas Archer Hirst, FRS, President of the Association, was in the Chair and summarised the actions and events to date. Referring to the syllabus already published:

- There was a general agreement that elementary geometry is no longer regarded as a perfect branch of knowledge but recognised that the principles of geometry constitute a living science to be improved and capable of furnishing new matter for thought for both teacher and student.
- We have not yet succeeded in bringing teachers generally and examiners especially to anything approaching unanimity as to the initial steps towards reform.
- Our self-imposed task was not to break too suddenly from old associations but to introduce greater freedom of treatment and prepare the way for recent extensions and improvements and to propose for general adoption a certain order of sequence in the fundamental propositions of geometry so the examiners might examine, without prejudice to examinees, more independently of the particular textbooks that might have been employed and of the individual teachers under whom pupils might have studied.

It is important to note that the Association's dispute with Euclid was not that he was too logical but that his *logic was faulty*. It still held the classical view that the logic was good for training the mind, though many members already realised that children could begin to learn about the objects, from which geometry makes its abstractions, at an early age. It therefore tried to persuade "conductors of examinations, at which pupils who have been trained under different systems present themselves, to frame their questions independently of any particular textbook".

By this time, sub-committees had been appointed to consider other aspects of geometry, and in 1881, it was decided to produce a textbook of *Elementary Plane Geometry*.

Before 1870 the British Association for the Advancement of Science had already set up a committee to study the effects on science teaching of defects in mathematics teaching. This committee had reported the problem in 1873 and in their second report in 1876 commended a syllabus for geometry put forward by the AIGT, and there had been joint meetings of the Science Masters and AIGT members including ideas about the "co-relation" of mathematics and physics.

In 1884 and 1888 with the support of the AIGT committee, Levett published *The Elements of Plane Geometry, Parts I and II*. This book was not allowed to deviate from Euclid's original sequence, and the Preface to Part II states:

> The Second Part of the Elements of Plane Geometry, now submitted to the Public, has been prepared on the same lines as the First Part issued two years ago. Books III, IV, V, of the Syllabus of Plane Geometry have been revised, Demonstrations of the Propositions supplied, and suitable Exercises inserted. The two parts contain the portion of Plane Geometry treated of in Euclid Books I to VI, with some additional matter, and afford a sufficient course for School Teaching. It will probably be found in most cases advantageous to postpone the study of Part II of Book IV, until after a first reading of Book V. The Association hopes shortly to publish Syllabuses of Elementary Solid geometry, and Geometrical Conic Sections, and probably also of Higher Geometry, indicting courses of study in these Subjects suitable for school purposes. (Levett 1888, Preface)

In this version of Euclid's Book IV, "ratio and proportion" was dealt with in two sections: commensurable magnitudes and non-commensurable magnitudes. The non-commensurable section was dealt with by a series of rather convoluted definitions about the *quantuplicity* (using inequalities) of a magnitude A with respect to another magnitude B.[7] The book was made very complicated for teachers and schoolchildren to use.

In 1887 and 1888, the examining boards of Oxford and Cambridge decided to "accept proofs other than Euclid's provided that they do not violate Euclid's order". This was somewhat of a breakthrough, but teachers were not persuaded to use the AIGT books.

By hoping to persuade other mathematics teachers to buy the book and follow the course, Levett was ahead of his time, and the books were not a great success, without being able to make any significant change in the minds of the examiners.

It is most important for a new organisation to have a means of communication, and *The Mathematical Gazette* appeared first in substantially its present form with

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[7] The problem was that Euclid's original text dealt with both commensurable and incommensurable magnitudes, and this produced a problem with the theory of proportion. In order to use ratio as a method of comparison, they had to find a way of simplifying and legitimising "simple" proportion.

Volume I, beginning in April 1896, and since the new Association was beginning to deal with other aspects of the curriculum, at the Annual General Meeting held at University College, London, on Saturday 20 March 1897, the Association for the Improvement of Geometrical Teaching changed its name to the *Mathematical Association* (Price 1995; Siddons 1948).

2.3 John Perry and His Practical Mathematics

Among the British reformers of mathematics education, the one who probably won the greatest renown in the world was John Perry (1850–1920), electrical engineer and mathematician (Howson 1973; Price 1981, 1983). Perry was born in Londonderry (Northern Ireland) in 1850 and attended school in Belfast from 1860 to 1864. He worked as an apprentice in the drawing office and pattern shops and attended evening classes in Belfast. In 1868 he won a scholarship to study engineering at Queen's College. He graduated in 1870 with first-class honours and, in the following year, taught physics and mathematics at Clifton College, Bristol. In 1874 he became honorary assistant to Professor Sir William Thompson.[8] In 1875 he was elected Professor of civil engineering at the *Imperial College in Tokyo*.[9] Perry collaborated there with W. E. Ayrton, publishing more than 20 papers on electrical subjects in British journals. In 1879 he returned to London, and in 1881 he worked for the *City and Guilds Institute of London* as its national examiner in mechanical engineering. In 1882 he was appointed Professor of mechanical engineering at *Finsbury Technical College*. He continued collaboration with Ayrton and worked as a consultant for a number of electrical, lighting, and telegraph companies until about 1890. In 1896 he was elected to the Royal Society.

In 1896 he was appointed Professor of mathematics and mechanics at the *Royal College of Science and School of Mines in London* which he held until 1913. In 1904 he became the general treasurer of the British Association for the Advancement of Science.

His experience of teaching was wide; he taught boys and men from all ages and levels of education who wanted to make their careers in technical subjects, and his lectures fired all the men and boys who had any scientific learning with enthusiasm. These were "working people", a very different section of society from the clever academic boys that were found in the public schools. Perry's pupils required interesting objects and mechanisms as a focus for their attention and were used to mea-

[8] Professor William Thompson (Lord Kelvin) was a mathematical physicist and engineer. At Glasgow University he worked on the mathematical analysis of electricity and the first and second laws of thermodynamics. He was an electric telegraph engineer and inventor with many other interests. In 1892 he was made Lord Kelvin, the first British scientist to be elevated to the House of Lords. Perry benefitted considerably from working in his laboratory.

[9] The Imperial College of Engineering in Tokyo was founded in 1873 to train young Japanese as engineers to be employed by the government. British staffs were appointed to most posts, and the Japanese students had to write their notes and graduation theses in English.

suring and weighing objects and building machinery, so Perry's teaching was developed in a very different context.

The *Department of Science and Art* encouraged practical mathematics for working men and asked Perry to give an account of practical mathematics that was to be a preliminary study to the different branches of mechanics for those unable to go through a longer course of instruction in mathematics. Perry's *Practical Mathematics: Summary of Six Lectures Delivered to working Men* was published in London in 1899. There are many exercises intended to be worked at after each section. A footnote on page 1 states:

> Apparently, in the introductory remarks in the first lecture on the reform of education there was much about the way in which most of Euclid can be covered by practical exercises in measuring and arithmetic to show the principles of the mathematics. Theoretical proofs are not necessary. It is not necessary to repeat them here.

In the first lecture, on *Arithmetic and Decimals*, he makes clear that from the beginning, with the use of decimals, "It is dishonest to use more figures than we are sure of". This is followed by a number of practical exercises using multiplications, division, and substituting decimal values into various formulae. He also introduces four-figure logarithm tables and shows, with exercises, how to use a slide rule.

Lecture II *Algebra* deals with using formulae, their manipulation and simplification plotting functions, proportion, arithmetic and geometric progressions, and compound interest.

Lecture III *Using Squared Paper* gives us many examples including interpolation, plotting exponentials, and finding areas, with *two more lectures* demonstrating families of curves, linear interpolation, intercepts on axes, gradients of lines, limiting values, and practical evaluation of dy/dx.

Next, there is a lecture (lecture VI) on *vectors*: magnitudes and directions; combining vectors; resultants; and many examples including three-dimensional exercises.

Here he insists:

> The system of teaching mathematics which I have brought before you is my own, …. it is the outcome of a lifetime of teaching men and boys, of experience of the ways of thinking of all kinds of men and boys in in all kinds of schools, night classes, and colleges; in factories and offices; in both scientific and in professional societies.
>
> My method is suited to the ways of thinking of average students. The orthodox method is suited to the ways of thinking of old philosophers only. …. I know that it must be the ideal system of all teachers who think for themselves. (Perry 1899, pp. 116–117)

Finally, there are sections on *geometry* where he recommends that as soon as a student knows how to evaluate formulae, he may take a course of *practical geometry*; assuming the truth of certain things from his own observation and his teacher's statements, what is wanted is a common-sense treatment of the subject that will interest the average student. He gives a brief, practical syllabus and shows that many propositions of various books of Euclid are equivalent to elementary algebraic statements or can be illustrated by drawing. Finally, in *Mensuration and Descriptive*

Geometry, he demonstrates work with the prism, cylinder, and cone using a decimal value for π.

In contrast to the syllabuses for geometry, arithmetic, and algebra produced by the Mathematical Association, these ideas are quite radical, stripping the subjects down to newly envisaged essentials for practical applications.

Perry's beliefs and his outstanding success with technical students led to his presentation to the Educational and Mathematical sections of the British Society for the Advancement of Science in 1901, which had a significant impact on the teaching of mathematics.

3 The British Subcommission and Its Reports

The published collection of the British Subcommission's reports (Board of Education 1912a) opens with the explanation that:

> These papers are intended to serve a twofold purpose being available. on the one hand, to form a volume or volumes of the Board's series of Special Reports on Educational Subjects, and, on the other hand, to be presented to the International Congress of Mathematicians which will be held in Cambridge in 1912 as the report of the British Sub-Commission referred to below.

Further, it is related that for the preparation of the reports, the President of the Board appointed an Advisory Committee consisting of C. E. Ashford, George H. Darwin, C. Godfrey, George Greenhill, G. H. Hardy, E. W. Hobson, C. S. Jackson, Joseph Larmor, A. E. H. Love, and George A. Gibson. And only after this is it related that, following a decision by the International Congress in Rome in 1908, an International Commission on Mathematical Instruction has been formed, for which reason the President of the Board has nominated three members of the appointed Advisory Committee to serve on the newly formed British National Subcommission. Remarkably, their names are not mentioned in this preface, but they were Sir G. Greenhill, who had already become Vice President of the International Commission, C. Godfrey, and E. W. Hobson.

It is noteworthy that there exists another edition of the reports, apparently prepared when all of the reports were published not individually, but together, in two volumes (Board of Education 1912b), which opens with a preface that recounts the events in a somewhat different order. In the beginning, we read the following:

> The present volume is the result of the action taken by the International Congress of Mathematicians at their meeting in Rome in 1908, when at the proposal of Dr. David Eugene Smith, Professor of Mathematics in Columbia University, New York, it was resolved to appoint an International Commission on the Teaching of Mathematics. This Commission was entrusted with the task of securing a series of Reports on the state and progress of mathematical instruction in various countries of the world. There were certain difficulties in arranging for the collection of reports in this country, and the Board of Education were approached and asked to give assistance in the matter.

This publication also tells about the appointment of the Advisory Committee, informing readers that precisely this Advisory Committee served in the capacity of the British Subcommission of the International Commission.

Without going into the reasons for the discrepancies between the two publications, let us note that both accounts immediately included the work of the Subcommission in the processes taking place in the country. A certain deliberate contrast between the British and the foreign approaches can also be felt in other publications devoted to the International Commission.

3.1 Publications About the International Commission

Without attempting to examine all of the extant publications, let us consider just two among them. The report by Godfrey (1912a), entitled simply "On the Work of the International Commission on Mathematical Teaching", may be considered representative. After briefly discussing the formation of the Commission on the basis of Smith's proposal, Godfrey reports that "There have been intermediate meetings on the teaching part of the subject, and one meeting was held last September at Milan", in which he took part; and he continues: "it may perhaps interest you if I describe very briefly the matters that were under discussion" (p. 243).

Further, he goes on to speak, first, about the relationship between rigour and intuition, noting that "The meeting did not discuss what ought to be the practice; it wanted to find out what is the practice"

> The discussion naturally tended to focus itself on geometry, and when one speaks of rigorous treatment of geometry an Englishman naturally thinks that Euclid is meant. Now, that is not the case in Italy. The Continental mathematicians do not regard Euclid as rigorous. When they speak of rigour they have in mind work on the lines of Hilbert and Peano. In their treatment it is necessary to discuss such points as what exactly is meant by "between." The word "between" must be explained by a series of definitions before you are allowed to use it. Again, with regard to "equal" you must have a definition of equality that does not involve superposition, because superposition involves taking a length from one place to another place, and you really cannot tell that it has not altered on the way. This conception of rigour, demanded by Italian methods, has apparently in theory been imposed upon Italian schoolboys. Well, at the other end of the scale stands Germany. In Germany the freest use is made of intuition, and the sphere for rigorous mathematics is admitted to be the university. (p. 244)

Then he moves on to the second question discussed at the conference in Milan: the question of "fusion" versus "purism". As he remarks:

> I never heard of fusion or purism before; and I take it that in this country mathematical criticism has not yet reached the stage of development in which those words can be used. Fusion is the attempt to combine the teaching of various subjects; purism is the ideal which says that each subject must be taught without the introduction of another. For instance, the fusionist school would combine analytical and geometrical conics,

trigonometry and geometry, the integral and differential calculus; the purist school would separate them. (p. 244)

The third subject discussed at the conference and reported by Godfrey was "to what extent schools and universities provide special courses of mathematics designed to apply to subsequent occupations in life". Here Godfrey reasons as follows:

Under such a heading one naturally thought of the question of engineering, but that was ruled out of the discussion as being too large a matter. Consideration was confined to the extent to which mathematical courses are supplied in schools and at universities for students of biology, statistics, insurance, problems of administration, and so forth. In Germany, of course, administration is a subject of considerable study… The most interesting point that emerged from the discussion was the experience of France. In France, at one time, it was attempted to provide special courses in the universities to cover the various applications in after life. On experience, those courses have been abandoned in favour of courses at schools providing for those possibilities. And that is done as follows: The unessential has been eliminated from the school course, and the time saved in that way has been used to give a wider foundation to a boy's mathematical knowledge. (p. 245)

In conclusion, he reports that the British reports are being prepared and that he is ready to circulate a list of them (although here C. S. Jackson, whom Godfrey represents as the Secretary of the English Committee, comments that some of the reports are still "in the air").

C. S. Jackson, Instructor in mathematics at the Royal Military Academy, Woolwich, himself reported about the work of the International Commission several months later (Jackson 1912). Beginning by saying that the Commission was formed on the initiative of Professor D. E. Smith, he then reports that "some 9000 printed pages were presented to the International Congress of Mathematicians at Cambridge". Remarking that it is impossible to go into all of the details, he writes that he "can only hope to mention one or two facts, and to give a general impression of the problems raised".

He goes on to praise the German and American reports, noting that "It is encouraging to find that our difficulties are not insular weaknesses but are shared by our professional brethren in America, and indeed throughout the civilised world" (p. 384). Naturally, he also raises the question: "What of the Perry methods?" and then explodes in the following tirade:

It is the fate of every reformer to be caricatured by his followers. An eminent man with a broad view of his subject as a whole, points out that a portion of it has been neglected. His followers see nothing but that portion. Professor Perry has always stood for sound mathematics, and the claim made by him for "Justice to the average boy" will never die. Professor Perry showed that the capacity of the average boy to deal with abstract reasoning had been over-estimated, and that the importance of concrete illustrations and of making good the claim of mathematics to rank with the humanities had been under-estimated. But some of his followers are unjust to the boy of special ability. They scrapped mathematics as a coherent subject and replaced it by shreds and patches. The signs of reaction are unmistakeable. The reaction will be led by technical institutions, roused by the deficient previous training of their students. We must see to it that the sound elements in reform are not swept away with the rubbish (p. 384).

Jackson concludes his report with the remark that it is difficult to give advice since advice given to one person might not be appropriate for another, and he ends with the following passage:

> It is fatally easy to deceive oneself as to the extent to which pupils appreciate refinements in mathematical analysis. And yet, after all, it is better to aim too high than too low. The sober prejudice of Englishmen, which De Morgan praised, has led to the postponement of valuable reforms, but it has also saved us from throwing away that which was, and is, good. The problem of combining a coherent and logical scheme of mathematical education with due attention to the average boy, and to the value of topics arising from familiar daily life in developing interest and an appreciation of accuracy, is a difficult one, but it is in process of solution. The labours of the Commission-in particular of the German aid American contributors-have forwarded the process of solution in many details. (p. 385)

3.2 The Reports of the British Subcommission

According to *L'Enseignement Mathématique*, the Subcommission released 34 reports in all (Iles Britanniques 1920–1921, pp. 332–334). In the publication by the Board of Education (1912a) mentioned above, these reports are listed:

1. Higher mathematics for the classical sixth form, by William Newbold.
2. The relations of mathematics and physics, by L. N. G. Filon.
3. The teaching of mathematics in London public elementary schools, by P. B. Ballard.
4. The teaching of elementary mathematics in English public elementary schools, by H. J. Spencer.
5. The algebra syllabus in the secondary school, by Charles Godfrey.
6. The correlation of elementary practical geometry and geography, by Helen Bartram.
7. The teaching of elementary mechanics, by W. D. Eggar.
8. Geometry for engineers, by D. A. Low.
9. The organisation of the teaching of mathematics in public secondary schools for girls, by Louisa Story.
10. Examinations from the school point of view, by Cecil Hawkins.
11. The teaching of mathematics to young children, by Irene Stephens.
12. Mathematics with relation to engineering work in schools, by T. S. Underwood.
13. The teaching of arithmetic in secondary schools, by G. W. Palmer.
14. Examinations for mathematical scholarships, by F. S. Macaulay and W. J. Greenstreet.
15. The educational value of geometry, by G. E. St. L. Carson.
16. A school course in advanced geometry, by Clement Vavasor Durell.
17. Mathematics at Osborne and Dartmouth, by J. W. Mercer.
18. Mathematics in the education of girls and women by E. R. Gwatkin, Sara A. Burnstall, and Henry Sidgwick.
19. Mathematics in Scotch schools, by George A. Gibson.
20. The calculus as a school subject, by Charles Samuel Jackson.

21. The relation of mathematics to engineering at Cambridge, by Bertram Hopkinson.
22. The teaching of algebra in schools, by Samuel Barnard.
23. Research and advanced study as a training for mathematical teachers, by G. H. Bryan.
24. The teaching of mathematics in evening technical institutions, by W. E. Sumpner.
25. The undergraduate course in pass mathematics generally and in relations to economics and statistics, by A. L. Bowley.
26. The preliminary mathematical training of technical students, by P. W. H. Abbott.
27. The training of teachers of mathematics, by Thomas Percy Nunn.
28. Recent changes in the mathematical Tripos at Cambridge, by Arthur Berry.
29. Mathematics in the preparatory school, by Elliott Kitchener.
30. Course in mathematics for municipal secondary schools, by L. M. Jones.
31. Examinations for mathematical scholarships at Oxford by A. E. Jolliffe; Examinations for mathematical scholarships at Cambridge by G. H. Hardy
32. Parallel straight lines and the method of direction, by T. J. Garstrang.
33. Practical mathematics at Public schools.
34. Mathematical examinations at Oxford, by A. L. Dixon.

Some of these reports consisted of several parts, for example, no. 33 included sections on Clifton College, Harrow School, Oundle School, and Winchester College.

The second edition of the publication (Board of Education 1912b) also contains reports by Fletcher (1912) and Godfrey (1912b) – the second of which was also published in the Proceedings of the Fifth International Congress of Mathematicians (Hobson and Love 1913).

The reports are written in different ways and address quite different topics. To some extent, they even argue with one another (e.g. reports 5 and 22 on algebra). Because it is not possible for us to discuss all of them, we will focus on three in greater detail.

The report by Godfrey (1912c) (i.e. item 5 on the cited list) is devoted to the algebra syllabus. The report is written freely – it tells less about what already exists than proposes something new. Moreover, although the author does, of course, supply certain clarifications that in his view were supposed to help foreign readers ("Foreign readers will understand..." he writes, e.g. on p. 281, and explains certain British details), he is unquestionably more concerned with British readers, whom he informs not a little in his report about what is being done in France and Prussia.

The report consists of several parts: I. Introduction. II. Algebra in the Secondary School Curriculum. III. Details of a Non-Specialist Curriculum. About the report's objective, the author writes as follows:

> The object of the present paper is to examine the aims proper to the teaching of algebra at school and to discuss what subject-matter should be comprised in the course in order to attain the aims in view. (p. 280)

Further, he subdivides the students (boys) into specialists, that is, those who will go on to study mathematics or become engineers, and non-specialists, that is, those who study mathematics as part of their general education. (Concerning girls, it is noted in passing that the specialists among them form a “minority [that is] numerically insignificant” (p. 280).) Pointing out that in Britain non-specialists are usually sacrificed in favour of the specialists and that it would be wrong, of course, to do the opposite, Godfrey proceeds to discuss how a programme might be designed that would, in the end, be useful to both groups.

In the discussion that follows, two key ideas can be identified: the first concerns the importance of functional dependence, and the second concerns mental discipline and the connection to problems that students actually face. Godfrey does not reject the idea of mental discipline altogether but presenting a series of artificial assignments, which in his view are unlikely to prove beneficial to anyone; he takes an ironic stance towards justifying them through the idea of mental discipline. On the other hand, his stance is not one of pure utilitarianism either. As he writes:

> Problem solving is a native form of mental game to which the mind betakes itself naturally at a certain stage, very much as the body betakes itself to ball games or skipping. We will assume that the instinct in each case is a correct instinct and makes for the development of mind or body. Arithmetical problem solving does something for our cerebral convolutions at a certain stage. (p. 287)

To be sure, he notes at once that the authors of textbooks cram their books with old and routine exercises, reducing the whole undertaking “to dust and ashes”.

Consequently, Godfrey then goes on to talk about structuring a course in such a way that, on the one hand, the need to study various topics or rules might be made obvious by posing problems comprehensible to students while, on the other hand, sections that are useless to non-specialists might be eliminated. At the same time, the idea of functional dependence must be clearly presented in the course. “We live in an atmosphere of functionality” (p. 290). For confirmation of his ideas, as has already been said, the author points to foreign experience.

Godfrey offers a long list of topics and techniques that might be dropped (e.g. working with fractions with enormous denominators or solving several equations of the second degree or higher simultaneously) while stipulating that what is retained must also be taught differently:

> No doubt a certain amount of mechanical drudgery is needed, and we find that a new course supplies it. But the drudgery is vivified by purpose and by a sense of progress. Mechanical drudgery at heavy algebraic fractions is not on the same footing as mechanical drudgery in solving a problem of trigonometrical surveying, whose data have been derived from actual observations. (p. 294)

In conclusion, Godfrey proposes to use the freed-up time to study (1) numerical trigonometry, (2) mechanics, and (3) infinitesimal calculus even with non-specialists (naturally, at a level accessible to them).

The report by Nunn (1912) is devoted to the training of teachers of mathematics. At the very beginning, the author writes:

> Two district subjects fall within the scope of this memorandum: (1) the existing arrangements for producing teachers of Mathematics; and (2) the principles that should determine the character of their training. The treatment of the first consists merely in a recital of facts; that of the second involves expression of the opinion which must be understood to commit no one but the writer. (p. 291)

It should be noted that the author nowhere systematically discusses for what kinds of educational institutions he proposes to prepare teachers of mathematics, although one might conclude that what he has in mind are first and foremost elementary school teachers, as well as teachers for technical schools and even middle schools. But university preparation in mathematics is virtually not mentioned.

The author begins by stating that today it has been recognised that knowledge of mathematics alone is not sufficient for the teaching of it and that “A candidate seeking his first post has an appreciably better chance of success, even in a “public” or a secondary school, if his qualifications include, in addition to a good degree, evidence that he has studied teaching methods under proper guidance” (p. 291). From here, the author proceeds to discuss what such “proper guidance” might actually look like, laughing at the idea that the future teacher must be taught only “tricks of management needed to keep a class of 80 children in reasonable order on a hot afternoon” and explaining that a new understanding of the subject must include “the recognition that efficient teaching involves sound judgement as to the things which should be taught, and the time and manner of teaching them” (p. 291).

Nunn notes that “The aim of the teacher of Mathematics is most profitably regarded as being not so much to communicate certain ‘truths’ as to cultivate a typical form of intellectual activity” (p. 291), and consequently the first order of business is to habituate beginning teachers of mathematics to a corresponding understanding of mathematics and of their task. From this, the author concludes that:

> The course of training should include general genetic psychology, and, in addition, a detailed study of the mathematical development of the normal boy or girl. In other words, the student in training must think his way afresh through the mathematical curriculum from the genetic standpoint; logic, psychology, and the history of the science being his guides. (p. 292)

The preparation of teachers is conceived of as combining lectures and theoretical work with practical work at a school affiliated with the college, and the author offers a rather detailed description of what such preparation should be like, as he sees it.

He splits the question of the mathematical preparation of teachers into two questions: Is it, in general, better that academic and professional work should be carried out concurrently or successively; and what are the best courses of actual mathematical study for the intending teacher? The first of these questions receives a decisive answer: it is better for teachers to complete their academic (mathematical) preparation first and only then to concern themselves with questions of pedagogy. The far more difficult second question is given only a limited answer, for it is rightly noted that this answer depends on where the future teacher is going to teach. One may conclude that, in the author’s opinion, for elementary school teachers, the knowledge acquired in middle school is sufficient, except perhaps with certain additions (the question is discussed in great detail, since the Board of Education required teachers to pass exams in mathematics, and here, in the author’s opinion, certain changes were called for).

The second part of the report is devoted to a description of the existing system, which the author divides into two types of institutions, those directly supported by the Board of Education and the rest. In either case, the system is regulated through exams, which must be passed to obtain various kinds of certifications, although the exams themselves are conducted by different institutions – for example, the National Froebel Union or the Cambridge University Teachers' Training Syndicate. The exams were quite exacting, as is made clear by the cited statistics (out of 1769 students who took the exams, only 922 received any kind of certificate — p. 298). As an example, the author mentions a paper intended to "test the candidate's knowledge of a) the facts and principles of such elementary mathematics as may appropriately be taught, either incidentally or formally to children under twelve; and b) the best methods of teaching the subjects" (p. 298). The educational institutions which prepared prospective teachers included various University Day Training Colleges, which usually offered a two-year course of study.

The author's words at the end of the report, however, are telling:

> The arrangements made to meet the needs of students who select Mathematics as their special professional subject are so various that no general description of them is possible. (p. 302)

The last piece examined here belongs to A. W. Siddons and forms part of a report on "Practical mathematics at Public schools" – Siddons (1912) writes about Harrow School.

First, he presents general information about the school, relating, for example, that it has three parts – the Classical side (corresponding in his words to the German Gymnasium), the Modern Side (corresponding to the Realgymnasium), and the Army Class. Most of the paper focuses, by and large, on the Modern Side. The course in mathematics includes work in a mathematics laboratory, which he describes in detail, focusing both on its practical organisation – what notebooks the students must use and what the size of the laboratory is – and on the content and objectives of this work.

There are two laboratories in all: one devoted to weights and measures and the other to practical mechanics. Boys work in them in pairs. The aims and objects listed by the author for the laboratory devoted to measurements are as follows:

(a) A clearer conception of length, area and volume.
(b) Some acquaintance with the units of measure and weight, and some slight power of guessing rough approximations to length, areas, volumes, and weights without the use of instruments.
(c) A practical knowledge of how to measure length, area, volume and weight.
(d) Clearer ideas as to the trustworthiness of results and the folly of giving results to too many significant figures.
(e) Enormous increase in interest in arithmetic, resulting in increased powers of concentration.
(f) Training of hand and eye. (p. 406).

The author stresses that work in the laboratories requires no extra time, since time for it can be freed up by somewhat reducing the time spent on studying arithmetic, which can be achieved painlessly, since it will be more than compensated for by the students' increased interest.

4 Some Members of the British Subcommission

Below, we offer the biographies of several members of the British Subcommission. Let us note at once that not all of the members are discussed – not even Sir George Greenhill, the Vice President of the fifth International Congress,[10] whose biography is well known (see, e.g. http://www.icmihistory.unito.it/portrait/greenhill.php). This section tells about several individuals who were important in the reform of mathematics education, whose work in many instances began prior to the formation of the International Commission and was continued after the work of the Commission ended. Thus, this section echoes the first section of this chapter.

4.1 Charles Godfrey (1873–1924)

Howson (1973), whose work is the basis for the exposition below, characterised Charles Godfrey as "one who had a very great influence on mathematical education in Britain" (p. 157). Charles Godfrey was born in 1873 and went to King Edward's Grammar School,[11] Birmingham, where Rawdon Levett was teaching. He spent five years in the top mathematical division, which in those days consisted of a dozen boys and usually contained scholars destined for Trinity College, Cambridge. Godfrey went up to Trinity in 1892 and became Fourth Wrangler in 1895. After success in the Mathematical Tripos, he taught at Cardiff University between 1896 and 1899, coached students at Cambridge, and helped Rawdon Levett for a year at Birmingham. In 1899 he started teaching at Winchester School and became a member of the Mathematical Association, to become actively involved in the reform of teaching mathematics nationally.

In 1901 Godfrey, together with others from public schools, wrote a letter which was published as the "letter of the 23 schoolmasters" that was included in John Perry's edited publication of the *Discussion on the Teaching of Mathematics* (Perry 1902, pp. 106–111) proposing a number of changes to the teaching of geometry, which was the main aim of the *Teaching Committee of the Mathematical Association*, founded in January 1902 to tackle the geometry problem.

Godfrey's influence was considerable and was the driving force of the work of the Mathematical Association Committee. Because he was a good mathematician, he was accepted in the professional world, and since he had enough experience of teaching schoolboys, he was able to get his ideas across the meetings of the *Mathematical Association* and the *British Association* and did much work on most

[10] George Greenhill was, by the 1908 Congress, empowered with Klein and Fehr to form a commission which would compare methods and syllabuses for mathematical education in the secondary schools of the various countries. He was a professor at the Royal Military Academy, Woolwich, and one of the world's leading experts on applications of elliptic integrals in electromagnetic theory, and he became President of the Mathematical Association in 1914.

[11] King Edward's was an Endowed Grammar School, established in 1552.

of the reports of the *Mathematical Association Committee*. He met with school Headmasters, lectured in London and Oxford, inspected schools, and examined for Oxford and Cambridge, London, Durham, and Bristol universities.

During the years 1899 to 1905, he was Senior Mathematical Master at Winchester where he completely revolutionised and modernised the system, a laboratory for practical mathematics was established, and mathematics took a much more prominent role in the work of the school than before. In 1905, he left Winchester and went on to become Headmaster at the Royal Naval College Osborne where a practical approach was required, and he was free from the restraints of external examinations. In 1921 Osborne College was closed and Godfrey became Professor of mathematics at the new Royal Naval College, Greenwich.[12]

Godfrey joined the efforts of Rawdon Levett and others in the Mathematical Association and was a key player in the attempts to change the rigid regulations controlling the examination of Euclid in schools. There were two basic approaches: change the geometry syllabus to give teachers more freedom in teaching or change the textbook. For a long time, the Mathematical Association chose to change the syllabus. But keeping Euclid as the model, the university examiners refused any changes. The alternative strategy, writing a new book, was tried by Levett and later by Charles Godfrey and Arthur Siddons, from Harrow School. *Elementary Geometry* (Godfrey and Siddons 1903) was published in Cambridge, but radical changes were about to happen.

After 1901, Perry's practical mathematics offered considerable possibilities for creating a separate practical course, and in January 1902, the Mathematical Association appointed its first Teaching Committee. The Geometry report was published in May 1902 (Mathematical Association Committee Report 1902a). This *Report* went to great efforts to produce a new syllabus, it offered separate "Introductory and Experimental" courses and a course of "Theorems by Construction", and then to cover the first six books of Euclid to satisfy the examining boards of university local examinations, the College of Preceptors, and Oxford and Cambridge, a detailed list of 61 amendments to the theorems was included.

In December 1902 Cambridge co-opted Arthur Siddons to a new Syndicate which then appointed a Committee to draw up a schedule of geometry. The report dated 9 May 1903 was accepted by the Senate, and this ended the domination of Euclid as a textbook. So, in the summer of 1903, less than 18 months after the Teaching Committee had been appointed, the first examination at Cambridge under the new regulations was held in March 1904.

This was not the end of the arguments and discussions concerning the teaching of geometry, however, and Godfrey participated in them very actively (Godfrey 1910a, 1920; MA 1923). He also participated no less actively in the reorganisation of the teaching of other mathematical subjects (Godfrey 1910b; Godfrey and Siddons 1912).

It would be no mistake to say that Godfrey was the most active British member of the International Commission. His participation in the Milan conference, his

[12] Godfrey was appointed Professor since the New Naval College had University Status.

authorship of one of the reports of the British Subcommission, and his presentation at the Fifth International Mathematics Congress in Cambridge have already been mentioned. It was he who prepared the British report for the conference in Paris (Godfrey 1914).

Howson (1973) quotes Godfrey's obituary (Siddons 1924):

> ... it is only those who knew him intimately who can appreciate how much of the reform of mathematical teaching in the last twenty years is due to his influence..., he seemed likely to be a dominant influence on the mathematical teaching of the country for many years to come (p. 176).

4.2 Arthur Warry Siddons (1876–1959)

Godfrey's closest collaborator was Arthur Warry Siddons. He was born in West Bromwich, Staffordshire, and educated at the same King Edward's Grammar School, Birmingham. There, he joined the mathematics class of Rawdon Levett and went on to Jesus College, Cambridge. He became Fifth Wrangler in 1898 and passed first class in part 1 of the Natural Sciences Tripos in 1899. In the same year he joined *Harrow School* to become Assistant Master teaching physics and mathematics until 1936. He became a member of the Mathematical Association and joined the action for reform with Charles Godfrey and others.

At Cambridge, Siddons had been Fifth Wrangler when the logician and analyst Godfrey Hardy was Fourth Wrangler, and they both came to the notice of senior figures like A. R. Forsyth (MA President 1903) and E. W. Hobson (MA President 1912). Hobson was an advocate of change, who informed Godfrey that the British Association would probably appoint a committee to report on improvements in mathematics teaching, thus encouraging Godfrey to write to the committee outlining reforms (Howson 1973). It was Siddons who with Godfrey composed the "letter of the 23 schoolmasters" that was presented to the 1901 *British Association for the Advancement of Science* meeting in Glasgow, where Professor Perry presented his reform agenda. Both Godfrey and Siddons were at the meeting and co-authored a critical response "from a Public School point of view" (Langley et al. 1901).

Their criticisms addressed many points in Perry's presentation, and they became an agenda for reform and understanding in different contexts. The most marked feature of Perry's presentation was the large amount of practical work, and Siddons and his co-authors offer some points that could be adopted with advantage to modify the work in our middle or lower forms.

Siddons was elected to the new Teaching Committee as secretary in 1902, which he held for the next 10 years. The aims of the Committee were twofold: to suggest reforms in mathematical teaching and to persuade examining bodies to revise their syllabuses and papers so that reforms could be made. The Committee published two significant reports: on geometry (Mathematical Association Committee Report on Geometry 1902a) and on algebra and arithmetic (Mathematical Association Committee Report on Arithmetic and Algebra 1902b).

As mentioned in the previous section, later Siddons was appointed to the Cambridge Syndicate that would decide on future examination requirements. Godfrey and Siddons' *Elementary Geometry: practical and theoretical* was published in 1903. The first 55 pages were concerned with experimental work, and the exercises in the theoretical part attempted to show that geometry was everywhere, with examples drawn from subjects such as astronomy and engineering. This began a new era of publication of mathematical texts by Godfrey and Siddons that became very popular and a model for others to follow.

Siddons continued with his work of reform with the Mathematical Association and was elected their President in 1935. He left Harrow in 1936.

4.3 Thomas Percy Nunn (1870–1944)

Thomas Percy Nunn was born in Bristol in 1870 to a family of teachers. He attended his parents' school and at 16 was helping with the teaching, producing school plays, and making models of mathematical instruments. He matriculated at Bristol University College[13] and continued to help with the school until his father's death in 1890, when he inherited the responsibility for the school management. Concerned he was too young for such responsibility, he went to teach in Halifax New School and in 1891 went to teach at a grammar school in London. He took the London BSc degree in 1890 and the BA in 1895. In 1903, he was mathematics and physics Master at William Ellis School, Haverstock Hill, and in the same year, he revised and published the school syllabus in science and mathematics (Nunn 1903).

This led to his recruitment to demonstrate teaching of science and mathematics to students from the recently founded *London Day Training College*,[14] whose students met on Saturday mornings at the Shoreditch Technical Institute. Recognised as an exceptional teacher of science and mathematics, he was appointed Vice-Principal of the London Day Training College in 1905, and in 1909 the College, now managed by the London County Council, became a school of the University of London. Around this time London University awarded him a DSc for a thesis which he later published as *The Aims and Achievements of Scientific Method* (Nunn 1907).

While Vice-Principal, he wrote his important contribution to the *International Commission on the Teaching of Mathematics and the Training of Teachers* (Nunn 1912). In 1913 he was promoted to Professor of Education in the University of London and was knighted for his services to education in 1930. The college expanded, taking in overseas students, and became the University of London Institute of Education in 1932, with Nunn as its first Director.

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[13] Originally Merchant Venturers Technical College was founded in 1595, which became University College, Bristol, in 1876, and Bristol University from 1909 until present.

[14] See Thomas (1978) for a Victorian Innovation – the Day Training College.

As a member of the Mathematical Association, (he was President from 1917 to 1919) he was involved in contributing to ongoing discussions about curricula and teaching methods and developing ideas which revolutionised the teaching of mathematics in the UK.

He published a number of books and papers of fundamental importance on a variety of educational subjects, on mathematics, its teaching, and on teacher training. He was best known at the time for his *Education: Its Data and First Principles* (Nunn 1920), advocating "progressive" teaching methods, with a rich and innovative contribution to pedagogy. His approach was that of a realist philosopher whose main concern was to reconcile psychological with scientific judgments, carefully examining the data of experience in order to find the principles which held the data together. Nunn saw education as a deliberative process fostering the growth of creative individuals where the preferential educational efforts, as embodied in curriculum and methods or techniques, or activities must be directed. "My purpose is to reassert the claim of Individuality to be regarded as the supreme educational end, and to protect that ideal against both the misprision of its critics and the incautious advocacy of some of its friends" (Nunn 1920, vi).

He was also President of the Aristotelian Society from 1923 to 1924 and President of the British Psychological Society.

4.4 William Charles Fletcher (1865–1959)

William Charles Fletcher was a senior member of the Board of Education and as such was responsible for much of the organisation of the British Subcommission. He was born in 1865. Son of George Fletcher, a Wesleyan Minister, he went to Kingswood School, Bath, and then to St John's College, Cambridge, from where he enjoyed rowing in the College First Boat, 18S3–87. He gained academic success as Second Wrangler in 1886 and gained his first-class part 2 Tripos in 1887. From Cambridge, he went to teach at Bedford Grammar School and then, in 1896, became Headmaster of Liverpool Institute, until 1904. In 1903, he was a member of the Mosely Commission,[15] enquiring into the American education system. Also, he authored various publications on the school mathematics and its teaching (e.g. Fletcher 1902a, b, and 1904).

In 1904, he was appointed to the post of Chief Inspector of Secondary Schools, responsible for organising the secondary Branch of the Inspectorate. This brought him into contact with the Association of Headmasters and the Northern Union Joint Matriculation Board; he was also responsible for the inauguration of the "Full Inspection of Schools" system (Siddons 1959).

[15] The 1903 Mosely Commission was a philanthropic intervention to reengineer the patchwork of English education and an attempt to modernise it and influence its government on a large scale. Its innovation was in its methods of influence as well as its scientific reports. The Commission was a hybrid, transnational institution, using comparison to modernise the government of education.

Fletcher made a significant contribution to grammar school education by bringing together the different types of secondary schools: the ancient "Endowed" Grammar Schools, the "Board Schools", the Organised Service Schools recognised by the Department of Science and Arts, and the new foundations created by Local Education Authorities under the Act of 1902. He assembled a staff team for the care and oversight of this diverse group by taking six of the staff from South Kensington Department of Science and Arts, and these were joined by others, like himself, from public and grammar school staff (Strachan 1959).

Fletcher was the author of many of the Board of Education's important circulars on secondary mathematics. Siddons (1959, p. 86) writes about circular no. 711:

> This was published in March 1909; it was the first authoritative statement suggesting that no attempt should be made to teach young pupils the (so called) proofs of the early theorems in geometry, but that their truth should be led up to and made obvious by intuition and experiment; then, with these theorems assumed as a solid basis, deductive geometry should be built up. Though it was some years before examining bodies decided not to require proofs of these early theorems, the effect of the circular was very far-reaching and led up to the reforms that have since been made in the teaching of geometry.
>
> The circular also suggested the lines on which graphical work in algebra should be developed: it said that the aim of such work should be to lead up to functionality and the calculus instead of the 'watered down' analytical geometry which was the feature of most of the chapters on graphs which were being hastily added to existing algebra textbooks.

In 1910 Fletcher became a member of the Mathematical Association and a leading member between World War I and World War II holding the presidency in 1939–1943. Fletcher made contributions to several influential reports on teaching mathematics (see, e.g. Baker et al. 1924). His unusual contribution on English and mathematics for primary teachers (Fletcher 1924) was published in the Gazette and by the Board of Education.

5 Conclusion

This chapter, of course, has not described all the work done by the British Subcommission. Bearing in mind that the Fifth International Congress of Mathematicians took place in Cambridge in 1912, in addition to what was done by the Subcommission directly, there were also projects in mathematics education connected with international activities. Let us mention, for example, the brief note by Abbott (1912) devoted, as its title attests, to the "Exhibition of Models at the International Congress". It was written in January 1912 and tells about the sections in which it is proposed to arrange the exhibition, namely, (1) Models and Diagrams, (2) Exhibition of Work, (3) Exhibition of Mathematical Textbooks, (4) Exhibition of Mathematical and Mechanical Apparatus (from makers) and (5) Specimen Syllabus. However, the note (or, more precisely, the letter) begins with the following words, which reveal the moderate degree of attention devoted to what was taking place:

> I regret to say that there has been very little response to the notice which was inserted in the last number of the Gazette respecting the exhibition of models, apparatus, books, etc., which the Association is organising in connection with the International Congress. (p. 201)

In general, it is difficult to judge the extent to which the international movement affected the community of teachers in Britain. As Fletcher (1912) writes at the beginning of his report:

> There is in England no conception of school Mathematics as a limited whole which should be studied in the entirety by all who complete a full course…. Even between schools of the same general type marked differences in the amount of Mathematics included in the course offered, to say nothing of the still greater differences often to be found between individual pupils or forms in the same school according to the special courses they are following. (p. 90)

The differences were in fact very great, and moreover, despite the attention being paid to what was taking place in other countries, specifically British characteristics were very acutely felt in the country. What was carried out as part of the international movement to a large extent became part of a national movement of reform, supported by a number of highly educated and talented figures, and the reports that were prepared were oriented to a large extent at a domestic audience. (It is noteworthy that, in addition to the work done on it by the Subcommission, the British education system was also the subject of a report prepared by the German researcher G. Wolff (1915), about which Howson (1984) wrote that it "still remains a model of a successful comparative case study" (p. 78).) While acknowledging the significance of the curricular reforms that took place during these years, we must not fail also to recognise the work of the Subcommission, which supported these reforms, and in certain respects initiated them.

References

Abbott, Percival W. H. 1912. Exhibition of Models at the International Congress. *Mathematical Gazette* 6 (96): 201.

Association for the Improvement of Geometrical Teaching (A.I.G.T.). 1878. *General Report* 6 (January 1878): 11–36.

Baker, H.F., E.M. Langley, W.C. Fletcher, M.J.M. Hill, W.J. Dobbs. 1924. The Teaching of Geometry in Schools: Report of 1923. *Mathematical Gazette* 12 (170): 73–91.

Board of Education. 1912a. *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom. Being a series of Papers prepared for the International Commission on the Teaching of Mathematics*. London: His Majesty's Stationery Office (HMSO).

Board of Education. 1912b. *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom. Being a series of Papers prepared for the International Commission on the Teaching of Mathematics*. Vols. 26 and 27. London: His Majesty's Stationery Office (HMSO).

Fletcher, William Charles. 1902a. The Teaching of Euclid's Elements. *School World* 4 (39): 102–103.

Fletcher, William Charles. 1902b. *Elementary Geometry.* London: Arnold.

Fletcher, William Charles. 1904. Introductory Work in Mechanics. *School World.* 6 (65): 170–172.

Fletcher, William Charles. 1912. The Position of Mathematics in Secondary Schools in England. In *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom,* by Board of Education 1912b, Vol. 26, 90–103. London: HMSO.

Fletcher, William Charles. 1924. English and Mathematics. *Mathematical Gazette* XII (169): 37–49.
Flood, Raymond, Adrian Rice, and Robin Wilson. 2011. *Mathematics in Victorian Britain.* Oxford: Oxford University Press.
Gillard, Derek. 2018. *Education in England: a history.* Chapters 6 and 7. www.educationengland.org.uk/history
Godfrey, Charles. 1910a. The Board of Education Circular on the Teaching of Geometry. *Mathematical Gazette* 5 (84): 195–200.
Godfrey, Charles. 1910b. The Teaching of Algebra; What is Educational and What is Technical? *Mathematical Gazette*, 5 (85): 230–244.
Godfrey, Charles. 1912a. On the work of the International Commission on Mathematical Teaching. *Mathematical Gazette* VI (97): 243–246.
Godfrey, Charles. 1912b. Methods of Intuition and Experiment in Secondary Schools. In *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom,* by Board of Education 1912b, vol. 26, 429–438. London: HMSO.
Godfrey, Charles. 1912c. The Algebra Syllabus in the Secondary School. In *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom*, by Board of Education1912b, vol. 26, 280–311. London: HMSO.
Godfrey, Charles. 1914. The Teaching of Calculus in Public and Secondary Schools in the United Kingdom. *Mathematical Gazette* VIII (109): 235–240.
Godfrey, Charles. 1920. Geometry Teaching: The Next Step. *Mathematical Gazette* X (145): 20–24.
Godfrey, Charles and Arthur W. Siddons. 1903. *Elementary Geometry: practical and theoretical*. Cambridge: Cambridge University Press.
Godfrey, Charles and Arthur W. Siddons. 1912. *Elementary Algebra*. Cambridge: Cambridge University Press.
Hobson Ernest W. and Augustus E.H. Love. (Eds.) 1913. *Proceedings of the Fifth International Congress of Mathematicians*. (Cambridge 22–28 August 1912) Vols I and II. Cambridge: Cambridge University Press.
Howson, Albert Geoffrey. 1973. Charles Godfrey (1873-1924) and the Reform of Mathematical Education. *Educational Studies in Mathematics,* 5 (2): 157–180.
Howson, Albert Geoffrey. 1984. Seventy-five years of the International Commission on Mathematical Instruction. *Educational Studies in Mathematics* 15: 75–93.
Iles Britaniques. 1920-1921. *L'Enseignement Mathématique* 21: 332–334.
Jackson, Charles Samuel. 1912. The International Commission on the Teaching of Mathematics. *Mathematical Gazette* VI (101): 384–385.
Klein, Felix. 1908, 2016. *Elementary Mathematics from a Higher Standpoint*. 3 Vols. Springer.
Langley, Edward M, Charles Godfrey, and Arthur, W Siddons. 1901. The Teaching of Mathematics. *Mathematical Gazette* II (30): 105–111.
Levett, Rawdon. 1884, 1888. *The Elements of Plane Geometry, Parts I and II.* London: Swan Sonnenschein, Lowrey & Co.
Lockwood, Thomas J. 1967. A History of Royal Commissions. *Osgood Hall Law Journal* 5 (2): 172–209.
Mathematical Association (MA). Committee Report on Geometry. 1902a. *Mathematical Gazette* II (33): 168–172.
Mathematical Association (MA). Committee Report on Arithmetic and Algebra. 1902b. *Mathematical Gazette* II (34): 181–183.
Mathematical Association (MA). 1923. *The Teaching of Geometry in Schools.* London: G. Bell and Sons.
Mayo, Charles H. P. and Charles Godfrey. 1923. *A Great Schoolmaster*. Mathematical Gazette, XI(165) (July 1923): 325–329.
Mehrtens, Herbert, Henk Bos, Ivo Schneider. 1981. *Social History of Nineteenth Century Mathematics.* Boston: Birkhauser.
Nunn, Thomas Percy. 1903. *William Ellis Endowed School. A Syllabus of the Courses in Mathematics and Science Followed in the Upper School*. London: Educational Supply Association.

Nunn, Thomas Percy. 1907. *The Aim and Achievements of Scientific Method: An Epistemological Essay*. London: Macmillan.

Nunn, Thomas Percy. 1912. The Training of Teachers of Mathematics. In *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom,* by Board of Education 1912b, Vol. 27, 291–307. London: HMSO.

Nunn, Thomas Percy. 1920. *Education its Data and First Principles*. London: Edward Arnold.

Perry, John. 1899. *Practical Mathematics. Summary of six lectures delivered to working Men by Professor John Perry, D.Sc., F.R.S. at the Museum of Practical Geology, Jermyn Street. February and March 1899*, with certain exercises supposed to be worked after every lecture. London. Her Majesty's Stationery Office.

Perry, John. 1902. *Discussion on the Teaching of Mathematics.* London: Macmillan.

Price, Michael Haydn. 1981. *The reform of English mathematical education in the late nineteenth and early twentieth centuries.* Unpublished doctoral dissertation. Leicester: University of Leicester.

Price, Michael Haydn. 1983. Mathematics in English Education 1860 – 1914: some questions and explanations in curriculum history. *History of Education* 12 (4): 271–284.

Price, Michael Haydn. 1995. The AMT and the MA: A historical perspective. *Mathematics Teaching* 150: 6–11.

Rogers, Leo. 1981. A Survey of Factors Affecting the Teaching of Mathematics Outside the Universities in Britain in the Nineteenth Century. In *Social History of Nineteenth Century Mathematics,* ed. Herbert Mehrtens, Henk Bos, Ivo Schneider, 149–164. Boston: Birkhauser.

Rogers, Leo. 2011. Mathematics Education in Scotland: A Brief History. *International Journal for the History of Mathematics Education* 6 (2): 23–54.

Siddons, Arthur W. 1912. Practical Mathematics in Harrow School. In *Special reports on Educational Subjects. The Teaching of Mathematics in the United Kingdom*, by Board of Education 1912b, Vol. 26, 403–409. London: HMSO.

Siddons, Arthur W. 1924. Obituary: Charles Godfrey. *Mathematical Gazette* 12 (171): 137–138.

Siddons, Arthur W. 1948. The A.I.G.T. and the M.A. *Mathematical Gazette* XXXII (300): 160–162.

Siddons, Arthur W. 1959. Obituary. W.C. Fletcher. *Mathematical Gazette* XLIII (344): 85–87.

Strachan, James. 1959. Obituary. W.C. Fletcher. *Mathematical Gazette* XLIII (344): 87.

Thomas, John B. 1978. The Day Training College: a Victorian Innovation in Techer Training. *British Journal of Teacher Education* 4 (3): 249–261.

Wolff, Georg. 1915. *Der Mathematische Unterricht der Hoheren Knabenschulen Englands.* Leipzig: Teubner.

Chapter 5
The Italian Subcommission of the International Commission on the Teaching of Mathematics (1908–1920): Organizational and Scientific Contributions

Livia Giacardi

Abstract In this paper, I will illustrate the Italian contribution to the activities of the International Commission on the Teaching of Mathematics (ICMI) from 1908 to 1920, focusing on the following aspects: the most relevant figures, with particular emphasis on their ideas on the teaching of mathematics; the influence of these activities on Italian education policies, paying attention to legislative measures, university courses, texbooks and debates; and the impact of the political situation in Italy on the collective action of the subcommission after the dissolution of ICMI.

My aim is to elucidate the role of the Italian community of mathematicians; the influence of Klein's ideas on mathematics education; the image of the Italian schools that emerges from the reports and the international discussions during the various meetings; and the effects of the devaluation of scientific teaching by the Giovanni Gentile Reform on the work of the Italian subcommission.

Keywords Castelnuovo · Enriques · Fascism's impact on education · ICMI · Italian subcommission · Klein · Mathematics teaching in Italy · Scorza

1 Historical Background

The historical roots of the Italian subcommission of the International Commission on the Teaching of Mathematics (Commission Internationale de l'Enseignement Mathématique, Internationale Mathematische Unterrichtskommission) can be traced back to the preparatory work of Section IV, dedicated to the historical,

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philosophical and educational questions of the International Congress of Mathematicians (ICM) held in Rome from the 6th to the 11th of April 1908, during which the Commission was established under the chairmanship of Felix Klein.[1]

Section IV – in particular with regard to educational issues – was much richer than in previous congresses and addressed questions that would occupy the new commission in the coming years: the programmes of the different levels and kinds of schools in the various countries, the methods of teaching geometry, the modern trends in teaching, the relationships between intuition and rigour, etc. The section was carefully prepared by Giovanni Vailati (1863–1909), a member of the Peano School of logic, with contributions from Gino Loria (1862–1954), a well-known historian of mathematics, who was informed about European reform movements, in particular that of Klein (see, e.g. Loria 1906). The Organizing Committee of the Congress, whose president was Pietro Blaserna (president of the Accademia dei Lincei) and whose secretary was Guido Castelnuovo (1865–1952), officially gave Vailati the task of looking for speakers for the didactic section in February 1907. Moreover, Castelnuovo suggested some names of scholars already agreed upon with Klein (J. Tannery, A. Gutzmer, E. H. Moore, A. R. Forsyth) and invited him to present on the teaching of mathematics in Italy. He also asked him to contact Loria who had some proposals to make.[2] In fact, during the previous year, Loria had been in contact with David Eugene Smith (1860–1944), a historian of mathematics and a mathematics educator, in order to get his advice on the didactic section of the future International Congress of Mathematicians. Smith answered him with a long letter, in which he first remarked:

> It seems to me that a pedagogical section should devote its energies to the larger questions of mathematical education, leaving the small details for discussion by associations of less importance.

Secondly, he suggested three questions that he presented in detail:

I. Is it possible to formulate a normal curriculum for a culture course in elementary mathematics, international in character, based as to difficulty on the psychological development of the child, and as to applications on the needs of the average citizen, and extending through the first 12 school years? (…)
II. What should be the basis of the applications given in regular culture courses in elementary mathematics? …
III. What is the ideal culture course in demonstrative geometry?[3]

For each of these themes, Smith also suggested the points that - in his opinion - should be treated. In particular, with regard to the second point provided above, he wondered if the applications of mathematics should be drawn from physics, from

[1] Concerning the origins and the early period of ICMI, see Schubring (2008a,b) and Donoghue (2008). Starting in the early 1950s, the commission took on the name of the International Commission on Mathematical Instruction. In what follows we will use the acronym ICMI for simplicity.

[2] G. Castelnuovo to Vailati, s.l. 16 February 1907, in FVM.

[3] D.E. Smith to G. Loria, New York, 12 January 1906, FVM; also in DESPP, Box 32. In FVM see also D. E. Smith to G. Vailati, New York, 27 May 1907 (Cart. 11, fasc.182); A. Gutzmer to G. Vailati, Halle, 17 July 1907 (Cart. 3, fasc. 87).

other sciences, or from daily life. With reference to the third point, he posed the following questions: When should the course of rational geometry begin? How much time should be devoted to it? Which and how many demonstrations is it advisable to introduce? What should be the interrelations between plane and solid geometry, between geometry and trigonometry and between geometry and algebra? Some of these issues would be submitted again, by Smith, at the end of his speech during the ICM in Rome, in the belief that "the influence of a Congress like this might greatly help many who are earnestly seeking to improve the teaching of mathematics" (Smith 1909, p. 477). A successive letter by Loria shows that he also asked for information about the mathematics programmes in the Italian secondary schools, the problems assigned at the final diploma exams, the most widely used textbooks as well as the books concerning pedagogical and methodological issues, according the comparative perspective that would characterize the actions of ICMI.

In Section IV of the 1908 ICM, there were thirteen communications on the teaching of mathematics, many more than those expected by Castelnuovo; mathematicians internationally known for their commitment to education presented a paper.[4] Nine countries were represented, and most of the talks were devoted to mathematics teaching in the secondary schools of the various countries. Among the speakers was Smith himself, who in his communication on the 9th of April proposed the creation of a standing committee to study issues related to the teaching of mathematics (*Atti* 1909 I, p. 45); this proposal was supported by F. Archenhold in the same session and was put forward again on the 11th of April, when Federigo Enriques (1871–1946), at Smith's suggestion, reopened the session, already closed. After a lively discussion involving R. Bonola, Castelnuovo, A. Conti, H. Fehr, C. Stephanos, Smith, Archenhold and Enriques himself, the following agenda was proposed by Castelnuovo and approved:

> Session Number Four, having recognised the need for a comparative study of the syllabi and the methods of mathematics teaching in secondary schools of the various nations, assigns the task of forming an International Commission, which would investigate the question and present its results at the next Congress, to Professors Klein, Greenhill and H. Fehr. (*Atti* 1909 I, p. 51, my translation)[5]

Seven daily bulletins were published during the Congress, giving news in real time on work, and the two main journals addressed to teachers - *Il Bollettino di Matematica* and *Periodico di Matematica* - published reports, sometimes very detailed, which focused on the talks of Section IV and on the proposal to establish an international commission concerned with the teaching of mathematics.[6]

After its establishment, eighteen countries from all over the world joined the commission. These included Italy, which was among the "major" countries with three delegates: Castelnuovo, Vailati and Enriques. The choice was quite obvious:

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[4] See http://www.icmihistory.unito.it/1908-1910/ICM-1908.pdf.

[5] On the backstory of this matter, see Donoghue (2008) and Schubring (2008a).

[6] See *Il Bollettino di Matematica* 1908, p. 102–120: all three steps of the proposal (Smith, Archenhold, Castelnuovo) are reported; see also *Periodico di Matematica* 1908, pp. 258–271, where only the first and the third steps of the proposal are cited.

Castelnuovo was secretary general of the Congress and together with Enriques was a member of the Italian School of algebraic geometry which was known and appreciated all over the world. Above all, both Castelnuovo and Enriques were in contact with Klein and shared his way of conceiving research, as well as his ideas on the teaching of mathematics (Giacardi 2013). The choice of Vailati, who represented secondary school teachers, was also natural, since at that time he was engaged in the work of the Royal Commission for the reform of secondary school and Klein, whom he had met in Göttingen in 1899, was one of his points of reference (Giacardi 2009a). Moreover, Italian was one of the four official languages, together with French, German and English.

2 The First Actions of the Italian Subcommission: The Meetings in Milan and Cambridge

The period we are dealing with, which goes from the origins of the International Commission on Mathematical Instruction to the declaration of its dissolution in 1921 (*EM*, 21, 1920–21, pp. 317–318), was rightly called the "Klein Era", because the charismatic figure of Klein, who combined a broad mathematical knowledge with a profound interest in education, marked strongly the early actions of the Commission. His influence is also evident in the work of the Italian subcommission, which closely reflected the ups and downs of ICMI.

The first meetings of the Italian subcommission were held in Padua on the 21st and 22nd of September 1909, on the occasion of the Congress of the Associazione Mathesis, the national association of mathematics teachers. There is a backstory that deserves to be mentioned. At that time, Francesco Severi (1879–1961), a young but renowned geometer, was president of the Mathesis. The Association's aim was precisely that of improving the school system and training mathematics teachers, so Severi attempted to become officially involved in the work of the Italian subcommission and his reasons were not groundless.

To reach his objective, in April, he wrote to the Ministry of Education. In his letter, Severi complained because the Mathesis had been left aside for the appointment of the delegates. Furthermore, he threatened to carry out his own inquiry on the teaching of mathematics in the Italian schools, an inquiry requested by ICMI, and asked for funding equal to that assigned to Italian delegation, if any. He also sought the support of Vito Volterra,[7] a famous mathematician and senator of the Italian Kingdom, and even suggested that Vailati should be encouraged to resign. He wrote: (My translation)

[7] F. Severi to V. Volterra, Padua, 13 April 1909 in Nastasi (2004, pp.176–178). In this letter a copy of the document written to the Ministry is included.

> Poor Vailati, afflicted as he is by his long illness, might do well to step down … and then much could be put to rights by having a replacement elected by the Mathesis.[8]

This behaviour on Severi's part led to the resignation of Conti, member of the Board of Directors of the Mathesis and collaborator of the Italian subcommission.[9] Severi's ambition to occupy top-level positions within the mathematics and the academic communities was well known to Castelnuovo and Enriques, who believed that it was important that the subcommission, while collaborating with the Mathesis, maintained its "freedom to act" and not be obliged to conform to the directives of this Association. Thanks to Volterra, an agreement was found, and in May, when Vailati died, his replacement was to be elected by the members of Mathesis. One condition, posed by Enriques and Castelnuovo, was that the replacement be a secondary school teacher.[10]

The Italian subcommission was formed during the Padua Congress of the Mathesis: Enrico D'Ovidio from the University of Turin, the author of a successful textbook of geometry for secondary schools, was nominated president, and Castelnuovo, professor at the University of Rome, was chosen as Secretary General. Vailati was replaced by Gaetano Scorza, at that time professor at the Technical Institute of Palermo. The other members of the commission were chosen from among both university professors with ample experience in education and secondary school teachers, who were almost all directors of journals devoted to mathematics teaching: S. Pincherle (University of Bologna); F. Severi (University of Padua and president of the Associazione Mathesis); C. Somigliana (University of Torino); G. Veronese (University of Padua); A. Conti (Scuola normale Margherita di Savoia, Rome, and director of *Il Bollettino di Matematica*); G. Fazzari (Liceo Umberto I, Palermo, and director of the journal *Il Pitagora*); G. Lazzeri (Accademia navale, Livorno, and director of *Periodico di Matematica*); and U. Scarpis (Liceo Minghetti, Bologna).[11]

In the course of these first sessions in Padua, and in keeping with the instructions of ICMI, a plan of activity was defined, assigning various members to report on mathematics teaching in primary and normal schools (Conti), in the secondary schools in Italy (Fazzari, Scarpis, Scorza e Lazzeri), on the mathematical training of engineers (Somigliana) and on the preparation of future teachers (Pincherle).[12]

To direct the work of those preparing reports, Castelnuovo illustrated the activities of ICMI and suggested the following issues to be addressed:

> What means can be used to increase the effectiveness of mathematics teaching in secondary schools?
>
> Which methods of teaching, different from those ordinarily used, were adopted and how successful were they?

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[8] F. Severi to V. Volterra, Padua, 20 April 1909 in Nastasi (2004, p. 180).

[9] F. Severi to V. Volterra, Padua, 14 April 1909 in Nastasi (2004, pp. 179–180).

[10] See Commissione internazionale per l'insegnamento matematico, *Bollettino della Mathesis*, 1909, pp. 53–56.

[11] *L'Enseignemnt Mathématique* (*EM* from now on) 12, 1910, pp. 135–136.

[12] Ibidem, p. 136.

> Is it useful to experiment with new teaching programmes and methods on a small scale before imposing them on all schools?
>
> Which means are best adopted for keeping all secondary school teachers informed about the new educational or scientific views? (Castelnuovo 1909, p. 52, my translation)

In any case, the Italian subcommission, according to him, was not to "deal only with statistical data; rather, it should address the investigation in higher fields and to deal with pedagogical and psychological issues" (Castelnuovo 1909, p. 2).

It is also worth mentioning that in his opening speech of the Congress, Loria, after illustrating the vicissitudes of the secondary schools in Italy, dwelt on the reform movements in France and in Germany, paying particular attention to the proposals by Klein (Loria 1909, pp. 20–23).

In 1911,[13] four new reports were assigned: one on geometry textbooks for secondary schools (Scorza); one on proposals for improving the teaching of mathematics from primary schools to the Scuole di Magistero (Teacher Training Schools) (Alessandro Padoa); another on the evolution of the teaching of geometry at university (Severi); and one on the proposals for reforming the teaching of mathematics in secondary schools (Giovanni Vacca).[14] An investigation into the evolution of the teaching of infinitesimal analysis at university was also planned, but the report was never assigned.

All the planned studies were carried out except for the last three. Eleven reports[15] were published between 1911 and 1912, and the results of the Italian subcommission's work in the Italian journals dedicated to mathematics teaching were widely disseminated. In particular, from 1911 to 1915, the *Bollettino della Mathesis* published information on ICMI, translations or summaries of general reports and, with different page numbering, the Italian reports in the supplement *Atti della Sottocommissione italiana per l'insegnamento matematico*[16]; from 1909 to 1914 *Il Bollettino di Matematica* gave room to ICMI and to investigations carried out in Italy, both in the section "Programs and relative proposals for reform" and in the column devoted to congresses and sometimes in the special section *Atti della Sottocommissione Italiana della Commissione Internazionale dell'insegnamento matematico*.[17] It is not surprising that the reports appeared in each of the two jour-

[13] *EM* 13 1911, p. 113.

[14] See G. Castelnuovo to Giovanni Vacca, Rome 3 January 1911, in Nastasi and Scimone (1995, pp. 45–46). In this letter Castelnuovo states that Vacca should prepare a report on the reform proposals of the Royal Commission and in particular on the mathematical programmes drafted by Vailati. He also adds: "Not only you do know the needs of our secondary education very well, but you have that broad-mindedness, which is so rare in the teachers of our schools". (my translation).

[15] The summaries (by E. Chatelain) of six reports (two by Lazzeri, two by Conti, one by Padoa and one by Scorza) of the Italian subcommittee were also published in *EM* 14, 1912, pp. 249–253, pp. 416–424.

[16] See *Bollettino della Mathesis*, 1911, pp. 1–14, 15–23, 25–33, 35–48, 49–80, 81–95, 97–110, 111–178, 179–214; 1912, pp. 131, 215–234, 235–247; 1914, pp. 85–108; 1915, pp. 45–50.

[17] See *Il Bollettino di Matematica*, 1909, pp. 38–39, 272–274; 1910, pp. 236–238; 1911, pp. I, 94–96, 133, 134–157, 157–192, 203–204, 213–248, 249–318; 1912, pp. 206–208.

nals, because the first was directed mainly to mathematicians and secondary school teachers, while the second was addressed especially to middle schools, including the "normal schools" for training primary teachers. In contrast, the *Periodico di Matematica*, after having published the full agenda of ICMI in 1909, once translated into Italian, reported on it only briefly until 1914.[18]

The president of the Mathesis from 1911 to 1914 was Castelnuovo, and the directors of the other two journals were, respectively, Alberto Conti and Giulio Lazzeri; all three were members of Italian subcommission, thus making it easy to understand the particular attention given to the activities of ICMI.

2.1 The Meeting in Milan

The first plenary meeting of the International Commission on Mathematical Instruction took place in Italy in Milan from the 18th to the 21st of September 1911 (*EM* 13, 1911, pp. 437–511). Two special subcommittees had been appointed at an earlier date to prepare for the meeting:

- Subcommittee A (for secondary teaching): E. Beke, Ch. Bioche, F. Klein, W. Lietzmann, G. Scorza, and J.W. Young
- Subcommittee B (for university teaching): C. Bourlet, H. Fehr, F. Klein, C. Somigliana, H. Timerding, and W. Wirtinger

Klein was included in both of them, and also members of the Italian subcommission were involved.

Subcommittee A was in charge of dealing with the questions concerning rigour in middle school teaching and the fusion of the various branches of mathematics; subcommittee B was assigned to consider the teaching of mathematics to students of physical and natural sciences.

Castelnuovo was charged with presenting the general report on the question of rigour (*EM* 13, 1911, pp. 461–468). In order to be able to compare the methods employed in the various countries, he focused his report on a single type of school (high schools with a humanistic orientation) and a single area of mathematics (geometry). Taking a number of school textbooks by renowned mathematicians as examples, Castelnuovo divided teaching methods up into the following kinds: (A) the purely logical method (e.g. Peano, Hilbert, Halsted), (B) methods based on empirical principles and logical development (e.g. Sannia-D'Ovidio, Veronese, Enriques-Amaldi), (C) methods consisting in alternating and mixing intuitive and deductive considerations (e.g. Borel) and, finally, (D) the intuitive-experimental method (e.g. Perry). The methodological approach denoted by (B) was further subdivided into three subgroups according to whether all the necessary axioms (BA)

[18] See *Periodico di Matematica*, 1909, pp. 184–190; 1912, pp. 43; 1913, pp. 95–96; 1914, p. 190–192.

are enunciated, only one part of them is given (BB), or only those that are not evident (BC) are explicitly set out.

Castelnuovo observed that from the reports received, it appeared that the Latin countries (Italy, France, French Switzerland) preferred method B, the Germanic nations (Germany, Austria, German-speaking Switzerland) method C and that England had passed from method BB to method BC. He also illustrated the evolution of the methods in the main countries and noted that while teachers in France, Germany and England, while remaining within the scope of B, had shifted to methods where more importance is given to intuition, in Italy, the inverse trend had occurred.

At the conclusion of his report Castelnuovo mentioned some unanswered questions: What difficulties do the students encounter in following the logical development of geometry, or the development of geometry based on experience? What can be done to overcome these difficulties? What are the results in both cases, not only as regards the usefulness for the students but also their overall culture?

After an initial comment by Klein, who underlined the profound difference between the textbooks and the actual teaching, an interesting discussion concerning Castelnuovo's report took place between Veronese, D'Ovidio, Bourlet, Hobson, Dintzl, Lietzmann and Enriques. While the comments of foreign mathematicians focused primarily on the situation of their own countries, the Italians preferred methodological questions. Veronese stated that excessive rigour was to be avoided in secondary school teaching. He also maintained that experimental intuitive teaching had to pave the way for deductive teaching and that the propositions presented without proofs (axioms or not) had to be obvious and explicitly stated. Regarding this, Enriques underlined the difference between the intuitive and the experimental method and cited as an example Vailati, who opposed the intuitive approach, but believed that it was important that logical rigour be flanked by actual geometric experiments.[19]

The general lectures were given by two Italians, one being Enriques and the other Giuseppe Colombo. First, Enriques illustrated the profound links between mathematics and the theory of knowledge, drawing examples from history and showing the importance of reinvigorating the dialogue between mathematicians and philosophers. Second, Giuseppe Colombo, rector of the Politecnico di Milano, addressed the problem of the mathematical preparation of future engineers and put forward the proposal to establish a minimum programme containing all the basic subjects that an engineer had to know regardless of his particular specialty and also suggested offering the subsequent possibility of choosing complementary and special courses according to individual attitudes and preferences.

[19] *EM* 13, 1911, pp. 464–468.

2.1.1 The First Group of Reports for ICMI by the Italian Subcommission

During the meeting the various national subcommittees illustrated the work done. The work done by the Italian subcommission appears to have progressed less than that of the other major countries due to the delay in releasing the promised funding by the Minister of Education.[20] It presented the five published reports among those that had been planned, providing a detailed picture of the organization of secondary schools (classical and technical), of the teacher training schools and of the first 2 years of university, highlighting defects and making proposals.

In order to appreciate correctly the influence of ICMI's activities on the Italian educational system, it is useful to look briefly at each report.

Scarpis and Fazzari (Scarpis 1911 and Fazzari 1911), who dealt with classical-humanistic schools (*ginnasio-liceo*),[21] observed that from the Coppino Decree of 1867[22] until the time of writing, the mathematics in these schools had increasingly lost importance because the legislation had relegated this discipline to a secondary status, with less than half of the number of hours allotted for Latin and Italian. In order to address this situation, they put forward the following proposals: increase the number of hours allocated to mathematics; restore the final written and oral exams; abolish the option of choosing between Greek and mathematics, introduced in 1904 by the Orlando decree; adapt the teaching to the psychological and mental development of the student; establish connections between the various sectors of mathematics; start from problems or questions of practical nature; present examples of applications to other sciences; and eliminate some topics and introduce new subjects.

In his report, Pincherle (Pincherle 1911) illustrated the shortcomings of the teacher training schools and proposed to establish, after the first 2 years of university, a special school leading to an educational degree (*laurea didattica*), distinct from that in pure mathematics (*laurea scientifica*), in which emphasis was placed on elementary mathematics considered from a scientific, critical and pedagogical point of view.

The organization of the first 2 years of university, which allowed access both to the continuation of university studies in mathematics, physics or chemistry and to the schools for engineers, was discussed by Somigliana (Somigliana 1911), who identified two approaches, the classic and the applied one; this last was gradually expanding with the establishment of the Politecnico di Torino and was aimed at the basic mathematical studies of engineering and applied sciences in general. Somigliana also reviewed the various teaching sectors and cited the most important treatises related to them.

[20] See the *Bollettino della Mathesis*, 1910, pp. 30–31.

[21] See the inquiry proposed by them in *Il Bollettino di Matematica*, 1909, pp. 272–273.

[22] In 1867 the Coppino Decree had imposed a "strange" timetable (Scarpis 1911, p. 26): of the 8 years of *ginnasio-liceo*, mathematics was only taught in 3 of them, and beginning only in the fifth year with arithmetic—without prior teaching: moreover, the last year, which prepared for the final exams, was also without mathematics (Giacardi and Scoth 2014).

Scorza (Scorza 1911) presented an extremely detailed report on schools and technical institutes, which was also the result of an inquiry carried out among about sixty teachers.[23] After a historical introduction, he provided statistical data and gave information on the programmes of the various sections of the technical institutes, pointing out that some colleagues introduced the concepts of function, limit and derivative on their own initiative, even in the absence of ministerial decisions. The main defect of these schools was the "double soul", that is, the fact that they had to prepare students, on the one hand, for administrative jobs and, on the other, for university studies. Further, Scorza criticized the teaching method, which tended towards exaggerated rigour or rigid purism, and underlined the fact that little or nothing was done to orient secondary school teaching towards university teaching or to coordinate it with that of closely related sciences. Conversely, in Europe, radical advancements had been made thanks to the reform movements of Klein, Perry and Borel.

2.2 The Meeting in Cambridge

During the Congress organized the following year by ICMI at the fifth International Congress of Mathematicians held in Cambridge (United Kingdom) from the 21st to the 27th of August 1912, the contribution of the Italian subcommission was not particularly significant, even though Castelnuovo and Enriques were part of the International Committee of the ICM and eight members or collaborators of the subcommission participated in the Congress.[24]

The Italian subcommission contributed only to the first of the two inquiries proposed by ICMI, "The mathematical training of the physicist in the University"; instead it did not send any contribution to the second inquiry, "Intuition and experiment in mathematical teaching in the secondary schools". The general report on the first inquiry was presented by Carl Runge from Göttingen (*EM* 14, 1912, pp. 495–507), and that on the second was compiled by Smith (*EM* 14, 6, 1912, pp. 507–534). It is rather strange that the Italian subcommission did not intervene in the discussion on the role of intuition and experiment because the debate on that theme was lively among the Italian mathematicians. In any case, the contribution to the discussion was reduced to comments given by Enriques following Runge's report. Enriques reproached the compiler of the report for adopting a "utilitarian" approach, paying attention, above all, to what kind of mathematical instruments are necessary to physicists; Enriques considered another problem to be of greater importance, namely, how to attract young people to the study of physics. In particular, he maintained that the current instruction in mathematical physics was characterized by an excessive development of the algorithmic aspects to the detriment of intuition (*EM* 14, 1912, p. 503).

[23] See also *Il Bollettino di Matematica*, 1911, p. 184.

[24] They were Castelnuovo, Enriques, Padoa, Pincherle, Severi, Somigliana, Vacca and Veronese.

2.2.1 The Second Group of Reports for ICMI by the Italian Subcommission

Notwithstanding the poor contribution, the Italian subcommission had carried out six other reports - by Lazzeri, Scorza, Conti and Padoa - that Castelnuovo presented briefly during the meeting (*EM* 14, 1912, pp. 488–489). Lazzeri presented two reports: in the first (Lazzeri 1911a), he considered the teaching of mathematics in industrial, professional and commercial schools that had sprung up throughout Italy by local initiative and, therefore, displayed an uneven organization and different curricula. For this reason he limited himself to exposing the aims and the programmes of the secondary commercial school in Florence and of the commerce high school in Bari. The report also contains statistical data related to the period between 1908 and 1909 and concludes with some reflections by Corrado Ciamberlini on industrial schools, which showed that the main defects of these schools were due to the lack of adequate textbooks. The second report (Lazzeri 1911b) concerns the teaching of mathematics in the Royal Naval Academy in Livorno, where Lazzeri himself taught, and in the Royal Military Academy in Turin, which since 1896 had assumed the character of a university. In both of these, algebra (determinants, linear systems, complex numbers, etc.), infinitesimal calculus, analytical and projective geometry (as well as descriptive geometry in Turin) and mechanics were taught with few differences and with a curriculum somewhat reduced, compared to those of the first 2 years of university.

In his report on the normal schools for the training of primary school teachers (Conti 1911a), Conti, a professor in the Royal Normal School "Margherita di Savoia" in Rome, traced the history of the legislative measures starting from the establishment of the first *Scuole di Metodo* at the beginning of the nineteenth century and examined the various programmes. He pointed out the defects of these schools, making reference to a report by his colleague Ersilia Bisson-Minio, and presented the recent reform proposals. In his second report, on the kindergartens and elementary schools (Conti 1911b), he underlined the adoption of the Frobelian method in the former and of the intuitive-experimental method in the latter.

The report by Padoa (Padoa 1912) presents a comprehensive plan to reform the teaching of mathematics from primary schools to the teacher training schools. In particular, as far as secondary schools are concerned, he maintained that mathematics teaching should be divided into three phases: preparatory (3 years), deductive (3 years) and complementary (2 years). In the preparatory phase the teacher should provide the basic notions of arithmetic and geometry by using intuition and experiment, while in the deductive phase the approach should be exclusively deductive. Depending on the type of school, the complementary phase should offer different themes such as reflections on the foundations of mathematics, notions on functions, complements of algebra, etc. Padoa, although not part of the Italian subcommission, had been involved in its activities as one of the best representatives of the Italian School of mathematical logic with experience of teaching in secondary schools, as Castelnuovo explicitly pointed out (*EM* 14 1912, p. 489).

Scorza, who at the time still taught in secondary schools, reviewed the most important textbooks of geometry for upper secondary schools, analysing the approach of each to the theories of congruence, equivalence and proportions (Scorza 1912). In particular, he underlined the fusionist approach of Lazzeri and Bassani, the introduction of the group of motions by Michele De Franchis and Faifofer's adoption of the theory of equivalence of Duhamel.

Reading all the reports, some remarks arise naturally. First, they show two different positions in the debate on intuition and rigour in mathematics teaching in Italy. For example, Padoa affirms that in the upper secondary school, the teaching of mathematics must be exclusively deductive without ever recourse to intuition or experience. Instead, Scorza criticizes a teaching method inspired by a rigid purism; he prefers those authors of texbooks who are able to successfully combine scientific and didactic needs, balancing rigour and intuition, such as Giuseppe Veronese and Enriques and Amaldi, while recognizing that the majority of Italian textbooks were oriented towards a logically rigorous presentation of elementary geometry. Moreover, we can notice that even though at the beginning of the nineteenth century the Italian secondary schools had many defects, there was a group of outstanding university professors and talented secondary school teachers, who were deeply interested in educational questions and tried to improve mathematics teaching through different channels: textbooks, journals, information on European reform movements and legislative measures. Finally, the role of the Italian School of algebraic geometry - Castelnuovo, Enriques, Loria and Scorza were members of it – is evident throughout the entire period in question.

3 The Paris Congress in 1914 and the Dynamic Participation of the Italian Subcommission

At the Heidelberg meeting (the 21st–23rd of July 1913), the Central Committee of ICMI decided to increase its membership from four to seven by adding three members, including Castelnuovo.[25] On that occasion the Commission resolved to focus its attention on the two following questions:

A. The results obtained by the introduction of differential and integral calculus into the upper years of middle school
B. The place and role of mathematics in higher technical instruction (*EM* 15, pp. 394–395)

To this end, two questionnaires were drawn up in the four official languages (French, German, English, Italian), with the aim of presenting the general reports during a congress to be held in 1914 in Paris.

[25] The others were E. Czuber from Vienna and J. Hadamard from Paris. See *EM* 15, 5, 1913, pp. 394–412.

The Paris Congress of ICMI (the 1st–4th of April 1914)[26] can be considered the first international conference on the teaching of mathematics. The two debated themes reflected the main interests of Klein, who was, however, unable to attend the meeting for health reasons.

Klein invited Castelnuovo to give the opening address in his stead, and together they drew up the outline. This choice is no coincidence. In fact, Klein knew that Castelnuovo shared his point of view on education and thus would have accepted his advice.[27] In his speech, after illustrating the aims of ICMI, Castelnuovo mentioned the important reform movement that, starting in 1902, had introduced the elements of infinitesimal analysis in French secondary schools. This was just one of the reasons for choosing Paris as the venue of the Congress. He concluded his talk by underlining how important it was that the mathematicians working in pure research also concern themselves with the problems related to teaching:

> We sometimes wonder if the time we devote to teaching issues would not have been better used in scientific research. Well, we answer that it's a social duty that forces us to deal with these problems. (Castelnuovo 1914a, p. 191, my translation)

The general reports on the two questions, which summarized the national reports, were given, respectively, by the Hungarian mathematician, Emanuel Beke, and by the German geometer, Paul Staeckel. Beke's report (Beke 1914) shows that the countries where the elements of infinitesimal calculus were included in the official syllabuses or in the curricula drawn up by the schools themselves were the following: some German territories (Bavaria, Württemberg, Baden, Hamburg), Austria, Denmark, France, the British Isles, Italy, Romania, Russia, Sweden and Switzerland. Beke then dealt with the following points: the scope of the teaching of infinitesimal calculus; its applications (geometric, physical, etc.); the question of rigour; the interactions between calculus and other subjects; and, finally, the reactions from secondary and university teachers. With regard to this point, Beke identified a singular fact: while secondary school teachers were generally enthusiastic about this innovation, university professors expressed a certain degree of coolness, if not hostility. According to Klein, the reason for this behaviour was due to the lack of rigour of the textbooks of infinitesimal calculus and to the gulf that existed between teachers and academics.

The report on the Italian situation was prepared by Castelnuovo, who took this occasion to illustrate the syllabus of the new *liceo moderno* that he had just designed, officially introducing for the first time the fundamental concepts of infinitesimal calculus in an Italian secondary school. He also stressed that, according to him, concepts that are too difficult for an average student (such as the Taylor series) should be left aside and that the teacher should likewise avoid the rough empiricism which conceals the logical character of mathematics and the subtle criticism that the

[26] *EM* 16, 3, 1914, pp. 165–226; 16, 4–5, 1914, pp. 245–356.

[27] See the letter by G. Castelnuovo to F. Klein, Rome, 3 March 1914: "Following your instructions, I have prepared the speech (rather short) that I am supposed to give in Paris in your place" in Luciano, Roero (2012, p. 209, my translation).

minds of students cannot appreciate at that age (*EM* 16, 1914, p. 295).[28] In this regard, Beke noted:

> We await with keen interest how the principles of the Calculus will be presented to the students in the country of mathematical criticism where Dini, Genocchi and Peano have treated these principles in a masterly way. We can be sure that if the work is done by the same men who, in their geometry textbooks, so interesting but so difficult to read in other countries, have sought with ability to reconcile a rigorous scientific treatment with the aims of the secondary teaching, our reform movement will be infinitely beholden to our Italian counterparts. (Beke 1914, p. 255, my translation)

In his report on the place and role of mathematics in higher technical instruction (Staeckel 1914), Staeckel dealt with a number of questions: (1) what kind of teaching should be provided; (2) which subjects, methods and books should be used; and (3) who should teach mathematics, whether mathematicians or engineers themselves. The prevailing opinion in the various national reports was that an engineer should receive a solid mathematical training, which, however, should forgo questions that are too specialized and marked by a purely theoretical interest.

A very lively discussion followed the two reports (*EM* 16, 1914, pp. 290–306, 328–356). The comments of the representatives of the Italian group were numerous and repeated on both themes and show once again two different points of view on the teaching methods. Padoa stressed the need to avoid the infinitesimal pseudo-intuition: a rigorous approach does not exclude appeals to intuition, but refuses that these appeals are surreptitiously made in definitions and demonstrations. He also maintained that the course of mathematics for engineers should not be distinguished from that for mathematicians by rigour but rather by the choice of topics to be treated, because without rigour there is no mathematics. Castelnuovo, on the other hand, was convinced that in addressing future engineers, the teacher should not give the illusion that the rigorous development of a theory is sufficient to carry the results into the applications because there is an abyss between theory and practice. For this reason he steered the debate towards the following two themes: (1) the place of mathematics in the syllabus for future engineers and (2) the style of teaching that should be adopted for the two categories of engineers, the technicians, who apply the already established science, and the theoreticians, who build the science of the engineer. Gino Fano, Enriques and Loria underlined above all the importance of not separating theory from practice and the utility for mathematics students to share some courses with engineers so as not to lose contact with real-world applications.[29]

All the above shows quite clearly the constructive participation of the Italian subcommission in the Paris Congress and the role of Castelnuovo and his driving force. He not only combined his own mathematical prestige with a vision of mathematics teaching very close to that of Klein but he also had a strong democratic spirit. From the beginning this attitude had driven him to involve both secondary

[28] See also Castelnuovo (1914b).

[29] See the debate on the same theme during the third Congress of the Mathesis Association held in Genoa in 1912, in *Atti*, 1913, p. 78–87.

school teachers and mathematicians such as Vailati and Padoa, whose point of view differed from his own in many respects but who shared his deep and sincere interest in the problems of education.

4 The Impact of the Earliest ICMI Activities on Italian Education Policies: Legislative Measures, Debates, Courses and Textbooks

In the years that preceded the establishment of ICMI, the Italian secondary education presented evident deficiencies that emerged from the poor results obtained by students in the final mathematics examinations and from the various inquiries made by the Ministry of Education. The causes were mainly due to the low level of preparation of teachers, the inappropriate teaching methods, the strong pre-eminence of humanities in the curricula over scientific disciplines and the persistence of large disparities between the different Italian regions.

To deal with this situation, on the 19th of November 1905, the Minister of Education, Leonardo Bianchi, appointed a Royal Commission for the Reform of Secondary Education, which included university professors, secondary school teachers and ministerial inspectors. The work of the Commission was completed in 1909; however, the proposed reform was never approved by the Ministry of Education (Giacardi and Scoth 2014). The curricula for mathematics and the methodological instructions had been prepared by Vailati, who introduced the concepts of function and the elements of calculus in the upper secondary schools following Klein's ideas (Giacardi 2009a).[30]

Klein's vision on education was well known in Italy by the members of the Italian School of algebraic geometry (Giacardi 2013), which included Castelnuovo and Enriques. However, the first activities of ICMI contributed to the spread of his ideas among teachers and also fostered an international perspective. In particular, Klein's thoughts on education inspired some changes in the curricula, influenced the debate on teaching methods and on teacher training and favoured the publication of new textbooks and the introduction of new university courses.

In this process, Castelnuovo, who was also president of the Mathesis Association from 1911 to 1914, played a key role. He was supported not only by a very active group of mathematicians, such as Enriques and Loria, but also by some talented secondary school teachers such as Vailati, Scorza, Scarpis, Padoa, Fazzari and Conti.[31] This is not surprising because at that time the best secondary school teachers

[30] In the Vailati archives, various documents give evidence that, even before the establishment of ICMI, he gathered a lot of information about the curricula in the European countries and the recent reform movements. See FVM, Cart. 41, fasc. 346, Cart. 31, fasc. 272.

[31] All of them had taught – and in most cases they continued to teach – in secondary schools, but they also had contacts with university. Vailati gave university courses at the end of the nineteenth century, when he was in Turin; in 1912 Scorza obtained a professorship at the University of

often also held classes at the university, and university professors often began their careers teaching in secondary schools. This fostered dialogue between the two.

In 1911, the Minister of Education, Luigi Credaro, established the *Liceo moderno* (modern secondary school), which differed from the *Liceo classico* from the second year. In the programs of the new kind of school, Greek was replaced by a modern language (German or English), the development of scientific subjects was broadened and elements of economic and juridical sciences were added. It was Castelnuovo who, together with the ministerial inspector Mineo Chini, designed the syllabus of mathematics and related instructions.[32] He accepted a number of Klein's proposals by introducing the notion of function and the concepts of derivative and integral, attaching a greater importance to numerical approximations and coordinating mathematics and physics teaching. He wrote:

> But if we truly wish the middle school student to feel an inspiring breeze in this modern mathematics, and perceive something of the grandeur of its whole structure, it is necessary to speak to him of the concept of function and show him, even summarily, the two operations that constitute the foundation of infinitesimal calculus. In this way, if he will have a scientific spirit, he will acquire a more correct and balanced idea of the exact sciences nowadays. (Castelnuovo 1919, p. 5, my translation)

On that occasion Castelnuovo wrote to Klein:

> With regard to teaching, sure that you will accept with pleasure the news, I am going to inform you that the (modern) programs of mathematics which I have adopted in the *licei moderni*, have been so well received that the Ministry of Education now thinks of introducing them even in the *licei classici* and in the technical institutes, by developing further, in these latter schools, the infinitesimal calculus. (My translation)[33]

Among the various textbooks written for this new kind of school, those worthy of note are Enriques and Amaldi's *Nozioni di matematica ad uso dei licei moderni* (1914–1915) and Sebastiano Catania's *Corso di algebra elementare per i licei classici e moderni secondo i nuovi programmi* (1914). Although both of these textbooks seek to follow the guidelines laid down by Castelnuovo, they show two different methodological approaches. While the second is strongly influenced by Peano's School of logic, the first is inspired by the reform movement "which is reflected in the work of the International Commission for the reform of the teaching of Mathematics" (Enriques and Amaldi 1914–1915, I p. IV). In fact, the authors of *Nozioni di matematica* open the textbook with a chapter on approximate measures and irrational numbers, discuss the calculation of areas and volumes from an

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Cagliari; besides teaching in secondary schools, Scarpis was *libero docente* (free lecturer) at the Bologna University; and since 1911 Padoa held several mathematical courses at the Genoa Naval School. Fazzari and Conti, as mentioned above, were directors of journals devoted to mathematics teaching.

[32] See "Ginnasio – Liceo Moderno. Orario – Istruzioni – Programmi", *Bollettino Ufficiale del Ministero dell'Istruzione Pubblica*, XL, 45, 30 ottobre 1913, pp. 2791–2795, also in http://www.subalpinamathesis.unito.it/storiains/uk/liceomod.pdf. Loria illustrated the new programmes in a German journal, see Loria (1914).

[33] See the letter of G. Castelnuovo to F. Klein, Rome 10 March 1915, in Luciano, Roero (2012, pp. 212–213).

elementary point of view by establishing connections between geometry and algebra, introduce the concept of function with ample use of grid paper, present elementary functions and trigonometry with particular attention to practical problems and introduce the concepts of limit, derivative and integral. They try to show the unity of mathematics, making evident the connections between the various branches; they "abolish the boundary" (Enriques and Amaldi 1914, vol. 1, p. III) between elementary and higher mathematics and between mathematics and the other sciences, from which are drawn problems, exercises and examples, especially to illustrate the concept of function.

The whole programme of the third Congress of the Mathesis Association (Genoa, 21–24 October 1912) also showed the influence of ICMI discussions and, in particular, of Klein, including the choice of the theme to be debated (ordering of the scientific and technical studies leading to the diploma of engineer) and the repeated references to the German mathematician in the lectures. Moreover the meeting was organized in connection with that of the Italian Society for the Progress of Sciences and with the support of the Italian Electrotechnical Association and the Physics Society, thus favouring the exchange of views between pure and applied sciences.

First, in the various sessions of the Congress, space was made for debate on the reports presented by the Italian subcommission of ICMI, which had not been previously discussed, as can be inferred from the complaints of Veronese (*Atti* 1913, p. 82). Moreover, Castelnuovo, in his opening speech as president of the Mathesis (Castelnuovo 1913), illustrated the basic tenets of his vision of the teaching of mathematics, which was very close to that of Klein: to avoid excessive specialism; to break down the barriers between the various observational sciences; to support theory with experience; not to disregard approximations; and to bring theory closer to applications. He also cited ICMI work throughout the Congress.[34] In his plenary lecture, Vincenzo Reina, professor of geodesy at the School of Engineering in Rome, dealt with "mathematics of precision and mathematics of approximation" (Reina 1913) and explicitly cited the lessons on this subject given by Klein in 1901 (Klein 1902), maintaining that it was important to complement theory with applications, because the former can provide a solid foundation for applied research and the latter can be a source of new theoretical research.

During this Congress, Castelnuovo also illustrated the innovations he had begun to introduce in editing the *Bollettino della Mathesis* in order to transform it in "a journal of mathematical culture in the broader sense".[35] In particular, he inserted into the *Bollettino* summaries of the activities of the Italian subcommission, translations of lectures and inquiries concerning problems related to mathematics teaching in the various orders of schools. He also encouraged debates concerning method. In this regard, he wrote to Giovanni Vacca:

> Almost unexpectedly and against my will, I have been elected president of the Mathesis. I accept the nomination only because I think that it might be helpful for the affairs of the Italian Commission for mathematics teaching, for which the Bollettino of the Math[esis]

[34] See, for example, *Atti* (1913), p. 71 and 82.

[35] See *Atti* (1913), p. 94.

> will become the publishing organ. I would like keep the level of the Bollettino high, reducing to a minimum the Byzantine discussions in which secondary teachers too often delight. I am therefore very much counting on your cooperation. (My translation)[36]

The influence of the international contacts favoured by ICMI can also be perceived in the discussions concerning teacher training, a topic that was addressed in many of the congresses and meetings of the Mathesis Association (Furinghetti and Giacardi 2012). In 1909, during the Congress in Padua, Castelnuovo explicitly proposed following Klein's example with regard to teacher training:

> At Klein's suggestion, during the spring holidays a number of German universities hold short courses for Middle school teachers. Couldn't we too set up similar courses in our universities? (Castelnuovo 1909, p. 4, my translation)

The points of views emerging from the debates were essentially two. Some, such as Pincherle - supported by Castelnuovo and Enriques - proposed the institution, after the first 2 years of university, of a special school leading to a degree in education (*laurea didattica*) to be attended by all those who intended to pursue a career in secondary teaching; a distinct degree in pure mathematics was instead intended for those who decided to pursue a career in research.[37] Others, such as Padoa, Loria and Giuseppe Peano, disapproved this solution and proposed instituting a 2-year course of Mathematical Methodology. This alternative course would make it possible to present not only topics of arithmetic, algebra and geometry useful for the future teacher but also to include an analysis of the teaching methods and the school textbooks, as well as to use the history of mathematics to reconstruct the development of each theory:

> The new university course we are suggesting would serve, in our opinion, to fill the deplorable abyss that separates university teaching from secondary teaching today, … which F. Klein has recently referred to as 'a system of double forgetting' (*doppelte Diskontinuität*): the university student's forgetting what he studied in secondary school, and the secondary school teacher's forgetting all that he studied while he was at university. (Loria and Padoa 1909, pp. 3-4, my translation)

Like Klein, both groups upheld the importance of elementary mathematics from an advanced standpoint for the preparation of future teachers. Precisely in this light, in 1900, Enriques published the *Questioni riguardanti la geometria elementare*. In the preface, he wrote:

> These topics have recently been developed in a series of conferences held by Mr. Klein, to which we are at least partially indebted for the idea of writing this volume. (Enriques 1900, p. VII, my translation)

This book was augmented and enriched in the successive editions under the new title *Questioni riguardanti le matematiche elementari* (2nd ed. 1912–1914, 3rd ed. 1924–1927).

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36 See the letter of G. Castelnuovo to G. Vacca, Roma, 27 January 1911, in Nastasi and Scimone (1995, p. 46).

37 See also the report Pincherle (1911).

For the same purpose, in 1909 during the Congress of Mathesis in Padua, Roberto Bonola presented a project of an encyclopaedia of elementary mathematics addressed explicitly to mathematics teachers and to students of the teacher training schools. This project would be completed only in 1950, but nevertheless shows the spreading of Klein's ideas throughout Italy.

In the years immediately following, Castelnuovo began to include in his courses in higher geometry in Rome a number of topics designed specifically for the scientific and methodological training of future mathematics teachers. From this perspective, the following notebooks are significant: *Geometria non-euclidea* (1910–1911), *Matematica di precisione e matematica di approssimazione* (1913–1914), *Indirizzi geometrici* (1915–1916), *Equazioni algebriche* (1918–1919) and *Geometria non-euclidea* (1919–1920).[38] In the introduction to the 1913–1914 course on the relationship between precise and approximate mathematics, Castelnuovo explicitly discusses the various ways in which future teachers can be trained and quotes Klein:

> The educational value of mathematics would be much enriched if, in addition to the logical procedures needed to deduce theorems from postulates, teachers included brief digressions on how these postulates derive from experimental observations and indicated the coefficients with which theoretical results are verified in real experience … The relationship between problems pertaining to pure mathematics and those pertaining to applied mathematics is very interesting and instructive. Klein, who dedicated a series of lectures to the subject (1901), describes the first of these as problems of 'precise mathematics' and the second as problems of 'approximate mathematics'. In this course we will … more or less follow the general outline of Klein's course. (My translation)[39]

It is no coincidence that the other two delegates, Enriques and Scorza, introduced in Roma and in Naples, respectively, courses of elementary mathematics from an advanced standpoint,[40] and Pincherle, another member of the Italian subcommission, did the same thing for the teacher training school at the University of Bologna from 1899–1900 to 1920–1921.[41] Other mathematicians followed their example, such as Corrado Segre in Turin.[42] Moreover, in 1910 and 1911, Scorza reviewed Klein's work, *Elementarmathematik vom höheren Standpunkte aus*, very carefully and in depth in the journal of the Mathesis Association,[43] so addressing mathematics teachers above all others.

[38] See http://operedigitali.lincei.it/Castelnuovo/Lettere_E_Quaderni/menuQ3.htm

[39] See http://operedigitali.lincei.it/Castelnuovo/Lettere_E_Quaderni/quaderni/nC913_14A/mostracom.htm, fols. 3–4.

[40] See "R. Università di Roma. Argomento dei corsi superiori di matematica", *Bollettino della Unione Matematica Italiana*, 2, 1923, p. 116; "Università di Napoli: corsi del secondo biennio", *Bollettino della Unione Matematica Italiana*, 1, 1922, p. 35.

[41] All of his annual reports show the importance he attached to elementary mathematics from an advanced standpoint and his growing interest in questions regarding the principles and foundations of mathematics (ASUB, Scuole di Magistero, pos. 53/b, busta 3 (1880–1921)).

[42] See, for example, his 1916–1917 course of advanced geometry *Vedute superiori sulla geometria elementare (1916–1917)* (BMP Fondo Segre, Quaderni. 30: http://www.corradosegre.unito.it/Quaderni/Quad30/1_30.php)

[43] See *Bollettino della Mathesis*, II, 1910, p. 130–146, III, 1911, pp. 48–54. On Scorza's vision of

When the Minister of Education Benedetto Croce abolished the teacher training schools with the Royal Decree dated the 8th of October 1920, some of the most vigorous oppositions came from the Mathesis Association and the two members of the Italian school of geometry, Loria and Fano. In particular, in 1921, during the Mathesis congress in Naples, Fano, who had spent a period of post-graduate work in Göttingen with Klein, energetically suggested the establishment of university courses of elementary mathematics from an advanced standpoint, with an emphasis on the historical, critical, methodological and didactical aspects, citing the lessons of Corrado Segre and Enriques as examples. He also invited faculties to accept dissertations for degree theses in complementary mathematics (*matematiche complementari*), that is, concerning those sectors of mathematics more strictly connected to elementary mathematics (Fano 1922).

The proposals were accepted, at least in part, by the Minister for Education, Orso Mario Corbino, who in 1921 established the "combined" degrees (*lauree miste*) in physical and mathematical sciences[44] aimed at qualifying young people to teach scientific subjects in secondary schools and in 1922 instituted a course in complementary mathematics, accompanied by didactic and methodological exercises.[45]

5 A Caesura in the History of the Italian Subcommission

The reasons for the ICMI crisis which, after World War I (1914–1918), led to its subsequent dissolution, have been already clarified by referring also to unpublished documents (Schubring 2008b, pp. 120–127). For this reason we limit ourselves to saying that the attempt by Henri Fehr, ICMI secretary general, to induce Klein to resign and to cede the presidency to Smith at the end of 1914 failed. In fact, Klein had signed the deplorable document, *Aufruf an die Kulturwelt*, which denied the war crimes of the German army, and only much later did it become known that many of the scholars who signed that document, including Klein, were completely unaware of its real content (Schubring 2008a, pp. 18–22). Most of the Central Committee, in particular Smith himself and Castelnuovo, supported him, so ultimately he remained in his office as the ICMI president. Castelnuovo wrote:

> All my colleagues in the Commission, I am sure recognize the admirable work of organization you have accomplished and the mark you have given to our work; they know that no one in this respect can replace you. Moreover, the serious moment that the international institutions are undergoing advises to introduce no change in their organization lest these weak organisms should succumb. On the contrary, we must endeavour to make them survive until the achievement of peace, so that they can ease the resumption of normal relations between peoples, as soon as the war is over … For the moment it is enough that every

mathematics teaching, see (Giacardi 2008b).

[44] See http://www.associazionesubalpinamathesis.it/storia-insegnamento/formazione-degli-insegnanti/#1513288613646-2be1ce59-d822

[45] See http://www.associazionesubalpinamathesis.it/storia-insegnamento/formazione-degli-insegnanti/#1513288614475-cd072737-4285

> country that has the strength to do so, continues the work it has planned. For my part, I will tell you that just now I have agreed with Mr Loria and Mr Pincherle (reporter for Italy) to draft the answers to the questionnaire on the training of teachers. (My translation)[46]

During the war and in the years immediately following, ICMI did not meet, and its activities suffered a sharp slowdown. In 1915, a questionnaire for the "Inquiry into the training of teachers of mathematics in secondary schools in different countries" was published in the four official languages. Loria was entrusted with the general report, and it was Pincherle who was supposed to be concerned with the Italian situation, as it appears from the above letter by Castelnuovo to Klein and also from a letter by Loria to Smith.[47]

From 1916 to 1922, the reports by some national subcommissions appeared in *L'Enseignement mathématique.* Italy was not included among them; the report by Germany was presented by Lietzmann.[48] Loria commented on this and wrote to Smith: "Have you received the German Report related to the Questionnaire? It's almost unbelievable that with so much on their plate, they find time to take care of IMUK!" (My translation).[49]

Meanwhile, on the 20th of September 1920, the International Mathematical Union (IMU) was formed. For political reasons, the former Central Powers (Germany, Bulgaria, Austria and Hungary) were excluded and were not allowed to participate in the International Congress of Mathematicians held immediately afterwards in Strasbourg (22–30 September 1920) (Lehto 1998, Section 2.6). Behind this campaign were French mathematicians, and Fehr supported them. During the congress, the ICMI mandate was not renewed (Schubring 2008a, pp. 23–27). ICMI was dissolved, but the subcommissions were permitted to continue with their activities and were instructed to send the product of their work to *L'Enseignement Mathématique* for publication. Echoes of these events are found in the letter from Klein to Enriques on the 13th of August 1920, in which he regretted that the work of ICMI had come to an end, but welcomed the fact that it could be continued unofficially through the subcommissions. Doing so would make possible the reunification of the Commission, when better times came.[50] In any case, Enriques maintained his contacts with Klein, and, likewise, Castelnuovo was a strong supporter of international cooperation.

[46] See G. Castelnuovo to F. Klein, Rome, 10 March 1915 in Luciano and Roero 2012, p. 212. See also the letter by Klein to Castelnuovo, Göttingen, 4 March 1915 at p. 211 and in http://www.icmihistory.unito.it/LetteraKleinLAST.pdf

[47] See G. Loria to D. E. Smith, Gênes, 28 April 1915, Smith, D.E. Professional, Special Collections, cit.

[48] *EM* 17, 1,1915, pp. 60–65, 129–145.

[49] G. Loria to D.E. Smith, Gênes, 29 November 1915, DESPP, Box 32. The international events led to the general report being presented only in 1932 during the International Congress of Mathematicians in Zurich (Loria 1933). The Italian report was prepared by the ministerial supervisor Alfredo Perna and not by Pincherle, who in the 1920s had to face bigger problems.

[50] F. Klein to F. Enriques, 13 August 1920, in Luciano and Roero (2012, p. 215)

In connection with the international events, the Italian Mathematical Union was constituted in 1922, with Pincherle as its first president. In the presentation of the programme of the new society, Pincherle hoped for the re-establishment of international collaboration:

> From now on, we can and must firmly hope that the echoes of the world conflagration having died away, the International Union shall fully live up to its name, gathering, in a not distant future, the scientists from all over the world: this is one of the vows of the Italian Mathematical Union. (Pincherle 1922, p. 1, my translation)

In that same year, 1922, following the march on Rome, Benito Mussolini became head of the Italian government, and gradually the Fascist dictatorship was established.

In 1923, Giovanni Gentile, Minister of Education, implemented a complete and organic reform of the Italian school system according to the lines of neo-idealistic philosophy. Secondary education was divided into two main branches: (1) the classical-humanistic and (2) the technical-scientific. The first branch, intended to train the future ruling class, was considered absolutely pre-eminent over the second branch. Moreover, the old programmes, which provided the teacher with detailed outlines of the subjects and also with helpful instructions on methodology, were substituted with examination programmes that indicated the objective, but not the way to achieve it. Protests were of no avail: neither those of the mathematicians nor those of the Mathesis Association and its president Enriques (Enriques 1923) and nor those of the Accademia dei Lincei, which expressed its dissent in a report edited by Castelnuovo (Castelnuovo 1923).

Castelnuovo, who had been invited by Gentile to collaborate in the drafting of the programmes, refused and was replaced by Scorza. Scorza tried to follow those tenets that had inspired the work of ICMI and its president, Felix Klein. In fact, he included elements of differential and integral calculus in the syllabus of the newly established *liceo scientifico* (scientific upper secondary school),[51] but he was constrained by the general framework of the reform, which did not recognize the formative value of mathematics and science, a fact that was in contrast with his own ideas.[52] In 1921 he had expressed his doubts about the neo-idealistic philosophical movement, behind which he seemed to "glimpse a hardly seductive nihilism" (Scorza 1921, p. 19). In 1923, he explicitly stated that "the philosopher who hasn't had a good education in mathematics pays bitterly for his deficiency", and he maintained the importance of a mathematics teaching which was not "passive or dogmatic" but which used an "active and heuristic method", developing both the creative imagination and an acute critical sense (Scorza 1923, p. 83).

The actors were still the Italian delegates of ICMI. Despite this, Gentile's reform, probably even more than the First World War, marked a break in the activity of the Italian subcommission which saw its efforts thwarted. Moreover, Klein, who had been the driving force of ICMI, passed away in 1925.

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[51] See http://www.associazionesubalpinamathesis.it/wp-content/uploads/2017/12/pl26.pdf

[52] See Giacardi 2008b: http://www.icmihistory.unito.it/portrait/scorza.php

The International Commission on Mathematical Instruction - as well as the Italian subcommission - remained stagnant until 1928, when once again an Italian city, Bologna, was the theatre of important events: the International Congress of Mathematicians took place here from the 3rd to the 10th of September 1928. It was organized by Pincherle who, by serving in the double role as President of the Italian Mathematical Union and President of the International Mathematical Union, succeeded in re-establishing international collaboration, removing the previous restrictions due to political reasons (Lehto 1998, section 2.6; Giacardi 2009b).

At the Bologna Congress, on the 4th of September 1928, during the Section VI devoted to elementary mathematics, under the chairmanship of Castelnuovo and at the prompting of Fehr, the mandate of ICMI was "prolonged", requiring that all countries present at the Congress be represented in such a way that would ensure international scientific cooperation. Smith was elected the new president, while Castelnuovo and Jacques Hadamard were the two vice presidents.[53] This rebirth, however, was short-lived because the re-established working group was incapable of producing new ideas and limited itself to finishing up projects that had already been started. Between 1929 and 1933, the reports of the various countries on the modifications made in mathematics teaching since 1910 and on the training of mathematics teachers were published in *L'Enseignement mathématique.*

The Italian reports offer a picture, even though somewhat mitigated, of the situation in Italy after the Gentile Reform. Enriques's account of this reform (Enriques 1929) appears less critical than might be expected: he limited himself to pointing out the reduction in the number of hours devoted to mathematics and the unsolved problem of teacher training. Instead, he gave ample space to the flourishing of new textbooks and presented his many initiatives (Giacardi 2012) aimed at teacher training: in addition to the book dedicated to elementary mathematics, *Questioni riguardanti le matematiche* (the second edition had just been published), he cited the school for specialization in history of the sciences annexed to the Istituto Nazionale per la Storia delle Scienze, which he had created after the reform, and the book series on the history of mathematics, entitled *Per la storia e la filosofia delle matematiche*, which he began in 1925 and which was expressly intended for teacher training.

Equally veiled are the criticisms of the Gentile Reform on the part of Loria in his general report on the theoretical and practical training of mathematics teachers for secondary schools (Loria 1933). The national report prepared by the ministerial supervisor, Alfredo Perna, on teacher training in Italy (Perna 1933) appears to be less ambiguous; in fact, it lists the institutional shortcomings in this area: there were no institutions for professional teacher training; there were no courses on methodology and pedagogy at the universities; there were no scholarships designated for teacher training; life-long learning was not compulsory; and training courses for in-service teachers were left up to individuals.

[53] See *Atti* (1929–1932), I, p. 113; *Il Bollettino di Matematica*, 24, 1928, pp. 153–154; *Bollettino della Unione Matematica Italiana*, 7, 1928, p. 273.

Even if Enriques and Loria prepared the reports for ICMI, the Italian subcommission actually no longer existed: no collective and coordinated activities were undertaken; rather, it was up to individual members to promote initiatives aimed at improving mathematics teaching, which had been undermined by the Gentile Reform. Echoes of the past ICMI activity continued to persist after its dissolution. Here I will cite only a few examples. In 1921 an article by Smith on the reforms of the mathematics teaching in the United States appeared in the *Periodico di Matematiche*, translated into Italian by Alma Enriques, one of the daughters of Federigo (Smith 1921). The following year Loria gave some news on the ICMI work in the *Bollettino di Matematica.*[54] In 1924, Dionisio Gambioli, professor of the Royal Technical Institute in Rome, translated into Italian the work of J. Wesley Young, ICMI delegate for the United States, entitled *The Teaching of Mathematics in the Elementary and the Secondary School* (1908). In the additional bibliography related to the period spanning 1906 to 1913, there is a digression on the activities of ICMI (Young 1924, pp. 519–526). Many years later, Enriques, in the entry "Matematica" of the *Enciclopedia Italiana* (Enriques 1934) and in the book *Le matematiche nella storia e nella cultura* (1938), cited the work of ICMI (Enriques 1938, p. 188).

This situation reflected both the disorientation within ICMI and the political situation in Italy: Fascism, with a series of so-called *leggi fascistissime* (extremely Fascist laws), promulgated between 1925 and 1928, gradually turned into a totalitarian regime, strongly limiting the freedom of the press, of teaching and of association, and ultimately - in 1938 - enacted the shameful racial laws. Castelnuovo and Enriques were targeted by these laws. Further, Scorza passed away in 1939.

The actors of the first phase of the story of the Italian subcommission were out.

6 Conclusions

From this historical overview, some concluding remarks can be drawn.

First, it appears that the first period of the Italian subcommission, from its founding up to World War I, was dominated by a charismatic personality, paralleling what took place in the early history of ICMI. Castelnuovo was in fact the driving force of the Italian group; he was the intermediary between ICMI and the educational world, supported by a group of secondary school teachers and university professors, who, in spite of occasional differences in points of view, worked together willingly. In his activity within the Italian subcommission and as president of the Mathesis Association, he succeeded in building an international network and in promoting an increased exchange of information on new movements for reform in Europe, in particular those reforms proposed by Klein, whose methodological approach he wholeheartedly endorsed. He made the *Bollettino della Mathesis* the spokesperson for the work of the International Commission on Mathematical Instruction and the

[54] See *Bollettino di Matematica*, 1922, p. XCIII.

Italian subcommission, introducing reports on their activities, translations of lectures, surveys and debates. He designed the innovative programmes for the *liceo moderno*, devoted some of the university courses to teacher training and dedicated various articles to issues relating to mathematics teaching (Gario 2006, Giacardi 2008a).

Moreover, we clearly see the role of the Italian School of algebraic geometry in the work of the Italian subcommission. Castelnuovo, Enriques, Loria and Scorza were well-known geometers, and all of them were in Turin to discuss or collaborate with Corrado Segre, the leader of this School, who was strongly influenced by Klein both in scientific research and in a vision of mathematics teaching (Conte and Giacardi 2016). Castelnuovo, Enriques and Loria were in contact with him even before the foundation of ICMI[55] and shared his ideas on education, albeit with some differences. In addition, they occupied prominent institutional positions, allowing them to spread information through journals, courses, lectures and reviews. Thus, it seems to me that, if on the one hand it is true that ICMI's activities stimulated the debate about certain themes among teachers and university professors in Italy, on the other hand their impact on the Italian education system went through the influence of Klein on Italian geometers.

Nevertheless, from the reports and – most importantly – from the debates during the ICMI meetings, it is evident that, in Italy, there were two different positions concerning the methodological approach to the teaching of mathematics: that of the Italian School of algebraic geometry was contrasted by that of the Peano School of mathematical logic. Despite the differing views, Castelnuovo always made room for different opinions and even involved Vailati and Padoa, members of the Peano school, in the activities of the Italian subcommission, because of their competence.

Another final remark. In the period between the two World Wars, the activities of the Italian subcommission reflected both the disorientation within ICMI and the political situation in Italy. Its mission continued through some of its representatives, in particular Enriques, Scorza and Loria, but the role of the teachers within the group gradually became increasingly less important, so the connective tissue that bound academic environments with secondary schools was lacking.

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[55] They collaborated on the *Encyklopädie der Mathematischen Wissenschaften* an international publishing enterprise promoted by Klein and other German mathematicians and corresponded with him (Luciano and Roero 2012).

Archival Sources

ALC: *Archivio Castelnuovo*, Accademia Nazionale dei Lincei: http://operedigitali.lincei.it/Castelnuovo/Lettere_E_Quaderni/menu.htm
ASUB: *Archivio Storico dell'Università di Bologna*
FVM: *Fondo Vailati*, Biblioteca di Filosofia, Università di Milano
DESPP: *David Eugene Smith Professional Papers*, Columbia University, Rare Book & Manuscript Library, Correspondence

References

Atti 1909. *Atti del IV Congresso Internazionale dei Matematici, Roma, 6–11 aprile 1908*, ed. Guido Castelnuovo. 3 vols. Roma: Accademia R. dei Lincei.
Atti 1913. *Atti III Congresso della Mathesis, Genova, 21–24 ottobre 1912*, 15–21. Roma: Cooperativa Tipografica Manuzio.
Atti 1929–1932. *Atti del Congresso Internazionale dei Matematici*, *Bologna, 3–10 settembre 1928*. 6 vols. Bologna: Zanichelli.
Beke, Emanuel. 1914. Les résultats obtenus dans l'introduction du calcul différentiel et intégral dans les classes supérieures des établissements secondaires. Rapport général, *L'Enseignement Mathématique* 16: 245–284 and 290–306 (Discussion).
Castelnuovo, Guido. 1909. Sui lavori della Commissione Internazionale pel Congresso di Cambridge. In *Atti del II Congresso della "Mathesis" Società italiana di matematica, Padova, 20–23 Settembre 1909* (Allegato F, 1–4). Padova: Premiata Società Cooperativa Tipografica.
Castelnuovo, Guido. 1913. La scuola nei suoi rapporti colla vita e colla scienza moderna. In *Atti III Congresso della Mathesis, Genova, 21–24 ottobre 1912*, 15–21. Roma: Cooperativa Tipografica Manuzio.
Castelnuovo, Guido. 1914a. Discours de M. G. Castelnuovo. In Compte Rendu de la Conférence internationale de l'enseignement mathématique, Paris, 1–4 avril 1914. *L'Enseignement Mathématique* 16: 188–191.
Castelnuovo, Guido. 1914b. La riunione di Parigi della Commissione Internazionale dell'Insegnamento Matematico. *Bollettino della Mathesis* VI: 85–88.
Castelnuovo, Guido. 1919. La riforma dell'insegnamento matematico secondario nei riguardi dell'Italia. *Bollettino della Mathesis* XI: 1–5.
Castelnuovo, Guido. 1923. *Sopra i problemi dell'insegnamento superiore e medio a proposito delle attuali riforme*. Roma: Tipografia della R. Accademia dei Lincei.
Conte, Alberto and Giacardi, Livia. 2016. Segre's University Courses and the Blossoming of the Italian School of Algebraic Geometry. In From Classical to Modern Algebraic Geometry. Corrado Segre's Mastership and Legacy, ed. G. Casnati et al., 3–91. Basel: Birkhäuser.
Conti, Alberto. 1911a. L'insegnamento della matematica nelle Scuole Normali. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico, *Bollettino della Mathesis* III: 111–178.
Conti, Alberto. 1911b. L'insegnamento della matematica nelle Scuole infantili ed elementari. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 179–214.
Donoghue, Eileen. 2008. David Eugene Smith and the Founding of the International Commission on the Teacing of Mathematics. *International Journal for the History of Mathematics Education* 3(2): 3–33.
Enriques, Federigo. 1900. *Questioni riguardanti la geometria elementare.* Bologna: Zanichelli.
Enriques, Federigo. 1923. Pro-memoria del Consiglio direttivo. *Periodico di matematiche* IV(3): 339–341.

Enriques, Federigo. 1929. Italia. Les modifications essentielles de l'enseignement mathématique dans les principaux pays depuis 1910. *L'Enseignement Mathématique* 28: 13–18.
Enriques, Federigo. 1934. Matematica. *Enciclopedia Italiana di Scienze, Lettere ed Arti*, 547–554. 22 vols. Roma: Istituto della Enciclopedia Italiana.
Enriques, Federigo. 1938. *Le matematiche nella storia e nella cultura*. Bologna: Zanichelli.
Enriques, Federigo and Amaldi, Ugo. 1914–1915. *Nozioni di matematica ad uso dei licei moderni.* 2 vols. Bologna: Zanichelli.
Fano, Gino. 1922. Le scuole di Magistero. *Periodico di Matematiche* 2(4): 102–110.
Fazzari, Gaetano. 1911. L'insegnamento delle matematiche nelle Scuole classiche. II. Critiche e proposte. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 35–48.
Furinghetti, Fulvia and Giacardi, Livia. 2012. Training of secondary school teachers in pre- and post-unity Italy (1810-1920). *ZDM - The International Journal on Mathematics Education* 44(4): 537–550
Gario, Paola. 2006. I corsi di Guido Castelnuovo per la formazione degli insegnanti. In *Da Casati a Gentile. Momenti di storia dell'insegnamento secondario della matematica in Italia*, ed. Livia Giacardi, 239–268. Lugano: Lumières Internationales.
Giacardi, Livia. 2008a. Guido Castelnuovo. In http://www.icmihistory.unito.it/portrait/castelnuovo.php
Giacardi, Livia. 2008b. Gaetano Scorza. In http://www.icmihistory.unito.it/portrait/scorza.php
Giacardi, Livia. 2009a. The School as "Laboratory". Giovanni Vailati and the Project to Reform Mathematics Teaching in Italy. *International Journal for the History of Mathematics Education* 4: 5–28.
Giacardi, Livia. 2009b. The Italian contribution to the International Commission on Mathematical Instruction from its founding to the 1950s. In *Dig where you stand. Proceedings of the Conference on On-going Research in the History of Mathematics Education (Garðabær, Iceland, June 21–23, 2009)*, eds. K. Bjarnadóttir, F. Furinghetti and G. Schubring, 47–64. Reykjavik: University of Iceland.
Giacardi, Livia. 2012. Federigo Enriques (1871–1946) and the training of mathematics teachers in Italy. In *Mathematicians in Bologna 1861–1960*, ed. Salvatore Coen, 209–275. Basel: Birkhäuser.
Giacardi, Livia. 2013. The Italian School of Algebraic Geometry and the Teaching of Mathematics in Secondary Schools: Motivations, Assumptions and Strategies. In *Geometria delle varietà algebriche, Convegno in occasione del settantesimo compleanno di Alberto Conte*. *Rendiconti del seminario matematico. Università e Politecnico di Torino* 71, 3–4: 421–461.
Giacardi, Livia and Scoth, Roberto. 2014. Secondary Mathematics Teaching from the Early Nineteenth Century to the Mid-Twentieth Century in Italy. In *Handbook on History of Mathematics Education*, eds. Alexander Karp and Gert Schubring, 201–228. New York: Springer.
Klein, Felix. 1902. *Awendung der Differential-und Integralrechnung auf geometrie.* Leipzig: Teubner.
Lazzeri, Giulio. 1911a. L'insegnamento della matematica nelle scuole industriali, professionali e commerciali. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 81–95.
Lazzeri, Giulio. 1911b. L'insegnamento della matematica nella R. Accademia Navale di Livorno e nella R. Accademia Militare di Torino. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 97–110.
Lehto, Olli. 1998. *Mathematics Without Borders. A History of the International Mathematical Union*. New York: Springer.
Loria, Gino. 1909. La scuola media e la sua attuale crisi di sviluppo. In Atti del II° Congresso della "Mathesis" Società Italiana di Matematica, Padova, 20–23 settembre 1909, 12–29. Padova: Premiata Società Cooperativa Tipografica.

Loria, Gino. 1906. La riforma della scuola media in Germania. *Il Bollettino di Matematica*: 208–218.

Loria, Gino. 1914. Les Gymnases-lycées “modernes” en Italie. *Zeitschrift für math. und natur. Unterricht aller Schulgattungen*: 188–193.

Loria, Gino. 1933. La préparation théorique et pratique des professeurs de mathématiques de l'enseignement secondaire dans les divers pays. *L'Enseignement mathématique* 32: 5–20.

Loria, Gino and Padoa, Alessandro. 1909. Preparazione degli insegnanti di matematica per le scuole medie. In *Atti del II° Congresso della “Mathesis” Società Italiana di Matematica, Padova, 20-23 settembre 1909,* All. A, 1–10. Padova: Premiata Società Cooperativa Tipografica.

Luciano, Erika and Roero, C. Silvia. 2012. From Turin to Göttingen: Dialogues and Correspondence (1879–1923). *Bollettino di Storia delle Scienze Matematiche* 32(1): 7–232.

Nastasi, Pietro. 2004. Considerazioni tumultuarie su Federigo Enriques. In *Intorno a Enriques*, ed. L.M. Scarantino, 79–204. Sarzana: Agorà Edizioni.

Nastasi, Pietro and Scimone, Aldo (eds.). 1995. *Lettere a Giovanni Vacca*. Palermo: Quaderni PRISTEM 5.

Padoa, Alessandro. 1912. Osservazioni e proposte circa l'insegnamento della matematica nelle scuole elementari, medie e di magistero. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* IV: 215–234.

Perna, Alfredo. 1933. Preparazione dei candidati all'insegnamento della Matematica in Italia. *L'Enseignement Mathématique* 32: 245–254.

Pincherle, Salvatore. 1911. Sugli studi per la laurea in Matematica e sulla sezione di Matematica delle scuole di Magistero. In Supplemento. Atti della Sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 1–14.

Pincherle, Salvatore. 1922. Programma della “Unione Matematica Italiana”. *Bollettino della Unione Matematica Italiana*, Numero specimen: 1–6.

Reina, Vincenzo. 1913. Matematica di precisione e Matematica di approssimazione. In *Atti del III Congresso della Mathesis, Genova, 21–24 ottobre 1912*. 28–48. Roma: Cooperativa Tipografica Manuzio.

Runge, Carl. 1912. The mathematical training of the physicist in the University, the report on which was presented by from Göttingen. *L'Enseignement Mathématique* 14: 495–507.

Scarpis, Umberto. 1911. L'insegnamento della matematica nelle Scuole classiche. I. I successivi programmi dal 1867 al 1910. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 25–33.

Schubring, Gert. 2008a. The origins and the early history of ICMI. *International Journal for the History of Mathematics Education* 3(2): 3–33.

Schubring, Gert. 2008b. The origins and early incarnations of ICMI. In *The First Century of the International Commission on Mathematical Instruction (1908–2008). Reflecting and shaping the world of mathematics education*, eds. M. Menghini, F. Furinghetti, L. Giacardi, and F. Arzarello, 113–139. Rome: Istituto della Enciclopedia Italiana.

Scorza, Gaetano. 1911. L'insegnamento della matematica nelle Scuole e negli Istituti tecnici. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 49–80.

Scorza, Gaetano. 1912. Sui libri di testo di geometria per le scuole secondarie superiori. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* IV: 235–247.

Scorza, Gaetano. 1921. Essenza e valore della matematica. In *Opere scelte*, III, 1–23. Roma: Cremonese.

Scorza, Gaetano. 1923. Il valore educativo della matematica. In *Opere scelte*, III, 77–97. Roma: Cremonese.

Smith, David E. 1909. The Teaching of Mathematics in the Secondary Schools of the United States. In *Atti del IV Congresso Internazionale dei Matematici - Roma, 6–11 aprile 1908*, ed. Guido Castelnuovo, III, 465–477. Roma: R. Accademia dei Lincei.

Smith, David E. 1912. Intuition and experiment in mathematical teaching in the secondary schools. *L'Enseignement Mathématique* 14(6): 507–534.
Smith, David E. 1921. Riforme nell'insegnamento delle matematiche agli Stati Uniti d'America. *Periodico di Matematiche* 1(4): 165–175.
Somigliana, Carlo. 1911. Intorno all'ordinamento degli studi matematici nel primo biennio universitario in Italia. In Supplemento. Atti della sottocommissione italiana per l'insegnamento matematico. *Bollettino della Mathesis* III: 15–23.
Staeckel, Paul. 1914. La préparation mathématique des ingénieurs dans les différents pays. *L'Enseignement mathématique* 16(4–5): 307–328.
Young, John Wesley. 1924. *L'insegnamento delle matematiche nelle scuole elementari e secondarie*. Translated by D. Gambioli. Milano: Remo Sandron.

Chapter 6
The Russian National Subcommission of ICMI and the Mathematics Education Reform Movement

Alexander Karp

Abstract In this chapter, the history of the formation and functioning of the Russian National Subcommission is examined against the background of, and in connection with, the whole reform movement in mathematics education that developed in Russia and, even more broadly, the movement that sought political changes in the country. The following topics are addressed: the formation of the subcommission, the subcommission's reports, Russian participation in international conferences and congresses, Russian commissions associated with reforms in mathematics education, and National Congresses of mathematics teachers. In writing this chapter, archival materials were used, as well as numerous articles from the journals and newspapers of the period.

Keywords Russian National Subcommission · Reform · Reports · First Congress of mathematics teachers · Second Congress of mathematics teachers · International meetings

1 Introduction

This chapter is devoted to Russia. The years during which the Russian subcommission of ICMI was formed and active are the years leading up to the revolutions of 1917 or the great upheavals, as they were described by Pyotr Stolypin (1862–1911), a major political figure of the time. Social and political tensions, which had seemingly little connection to the teaching of mathematics, found expression in debates about this topic as well. The reform movement in mathematics brought together individuals with completely different views about social problems, and this became particularly apparent following the October Revolution of 1917, when some mathematical reformers were forced to emigrate or to languish in poverty, while others received government supports and a certain degree of power, although not for long.

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The movement's very heterogeneity has made it difficult to study, while the project of describing Russia's role as part of the international movement (rather than its leader) has not always been consonant with the demands that held sway in the country.

Consequently, the literature on the Russian reform movement as part of the international reform movement is modest, even in Russian. Without attempting to provide a complete overview of all the existing literature here, we must mention Bychkov (1975), which is a book that remains in our view the most comprehensive compendium of information in Russian both about the work of the subcommission and more broadly about the work of reformers in the sphere of mathematics education. This subject is also addressed by the works of Metel'skii (1967, 1968). In recent years, studies about the international commission on mathematics instruction have been published by Gushel' (2002, 2003). Karp (2017) drew on previously unstudied archival documents pertaining to the Russian subcommission (the present article is based in large part on that study). It should also be pointed out that, for example, Russian mathematics teachers' congresses, which were undoubtedly connected with the work of the subcommission, have been treated in numerous studies, but the connection between them has not often been emphasized.

Campaigns aimed at "fostering Soviet patriotism," which were carried out at different times with varying levels of intensity, lead researchers to deny or at least to minimize foreign influences. Markushevich (1950), a major figure in mathematics, deliberately specified that the Russian mathematics educator Sheremetevskii was far ahead of "the ideas of the famous 'Meran program' (1906), which some of our educators and scholars, in a fit of bowing down before the West, once regarded as a kind of revelation" (p. 3)[1].

An article by Metel'skii (1968), published during more liberal times, nonetheless contains a special discussion of "whether it is indeed the case that the reform movement began to develop in Russia under the influence of Klein" (p. 8). Citing an article by Lankov (1949), he contends that reformist ideas had been expressed in Russia before Klein (for greater credibility, he quotes from the *Great Soviet Encyclopedia*, which indeed states that Russian scholars had already reached the same conclusions at the end of the nineteenth century, while in Western Europe these ideas acquired currency only at the beginning of the twentieth century (p. 9)).

Even so, a few pages later, Metel'skii – whose book was after all published in 1968, and not during Stalin's lifetime – remarks that "the denial of foreign influence is also unacceptable," which the already cited Lankov now turns out to have been guilty of, since he "pronounced the prominent Russian educator-mathematician V. R. Mrochek a 'troubadour of foreign influences in the methodology of mathematics'. After all, V. R. Mrochek was doing something useful, actively facilitating a broader familiarization with Western mathematical-methodological concepts among Russian educators" (p. 19). The propaganda of national exceptionalism (represented as patriotism) continued to exert an impact in later times as well.

[1] All translations from Russian are by the author.

The importance of Western influences for the development of Russian mathematics education, including the influence of ICMI, is undoubtable – it was acknowledged by Russian mathematics educators at the beginning of the century, who rightly not saw in it anything shameful. They wrote about it, for example, as follows:

> The teaching of mathematics in the schools of all countries is going through a deep crisis, which in Western Europe and the United States has already given rise to a vast literature and has found expression in the radical restructuring of school curricula and reforms in teaching methods. During the last decade, due to the penetration into Russian schools of new opinions about problems and methods of instruction and education [...] attempts to reorganize the archaic course in mathematics have begun to be seen in Russia as well. (Tsvetkov 1911, p. 14)

Or even as follows:

> a movement has arisen that is aimed at improving the teaching [of mathematics]. This movement is seen in all cultured countries. In Russia, it shines, as it were, with a reflected light, or more simply put, Russian methodology is kept alive by an impetus from outside, from England and Germany, France and the United States. (Belliustin 1912, p. 36)

There is no need here to enter into a discussion of the degree to which various Russian experts who voiced reformist proposals were independent of the literature (including foreign literature) that existed at the time (the same Sheremetevskii (1895), for example, writes: "It is not surprising that voices in favor of including the elements of [higher mathematics] in the secondary school curriculum have been heard for a long time" (p. 110), which could hardly be read as a claim to priority in the expression of this idea). The reform movement, supported by ICMI, did not arise all at once and was influential precisely because its ideas were consonant with those reached in very different countries by very different people.

At the same time, certain methodological problems do indeed arise before the student of the role of the subcommission of ICMI within the Russian reform movement. As has already been said, in Russia at the beginning of the century, the need for changes – reforms or even revolutions – was felt with extraordinary urgency. Schools in general, and the teaching of mathematics in particular, were swept up in that broader wave.[2] Therefore, it is impossible to equate that reform movement which was in one way or another connected to ICMI with the overall movement for reforms in the teaching of mathematics, although distinguishing between them is not always easy – often, the same people became involved in both (as has already been said). Below, we will aim to address mainly those events and phenomena whose connections with ICMI are evident based on the actions and statements of their participants. Subsequent sections will discuss the formation and work of the subcommission; its most active members; responses to its work, including congresses of mathematics teachers; and planned and realized reforms. But first, in order to provide a picture of Russian mathematics education at the time when the

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[2] In other fields, too, there occurred a politicization of seemingly altogether incongruous material. The great Russian theater director Stanislavskii (1929) described a performance of Ibsen's play *An Enemy of the People* (*Dr. Stockmann*), which turned into a political demonstration: "During that restless political time – before the first revolution – the feeling of protest was strong in society... A revolutionary play was needed – and *Stockmann* was transformed into one" (p. 428).

subcommission was established, we will address the discussions and attempts at changes that preceded its establishment.

2 Before 1908

Before the revolution of 1917, many different types of schools existed in Russia. The number of illiterate people declined every year – estimates of it vary – but even according to the most optimistic estimate of the literacy rate at the time of the revolution, given by Ignatiev (1933), the former czarist minister of education, only 56% of the population was literate and only 91% of children attended schools (p. 663). A great variety of different basic schools existed, which included schools supported by the government – first and foremost, local government – as well as schools supported by religious agencies or different societies. Nonreligious educational institutions that offered a secondary education (sometimes with certain limitations) included military schools (cadet corps), commercial schools, and *real schools* (organized on the model of German *Realschulen*), as well as gymnasia, which alone gave their graduates all rights to enter higher education institutions. Educational institutions could be public or private "with official rights" (or without them). Education was separate for boys and girls, and women's educational institutions had certain limitations.

Shcherbina (1908) notes at the very beginning of his overview of "studies and opinions pertaining to the improvement of secondary school mathematics curricula" that male gymnasia, by the time that his book was written, were required to adhere to the curricula and programs of 1890, which were not very different from the curricula and programs of 1872. Thus, the need to update curricula (including mathematics curricula) or at least the need to discuss such an update was universally recognized. Shcherbina (1908) discusses in considerable detail the proposals of several conferences and committees, most of the materials from which had been published.

The proposals of participants in conferences that took place in 1899 in the Moscow school district are, to a certain extent, criticized by him (although he notes that many respected professors and educators took part in them):

> In the proposed curricula and the explanatory notes accompanying them, one can find serious ideas and a desire to improve the currently existing organization of educational content, but they contain almost no attempts to introduce a new direction into the teaching of so-called elementary [or school] mathematics, to introduce those ideas which must permeate the entire course in mathematics – the idea of the functional dependence of quantities in relation to the idea of the continuity. (p. 34)

And indeed, the proposals mostly amounted to suggestions to remove from the courses in algebra and arithmetic exercises that were excessively cumbersome, or on the contrary, to add various kinds of assignments to the course in geometry. The possibility of including the elements of so-called higher mathematics in the mathematics course was discussed but with extreme caution (and Professor N. Ye. Zhukovskii even remarked that he considered it "completely out of the question that the foundations of the higher sciences, such as the differential calculus, theoretical mechanics, general chemistry, and so on, should be included in the secondary education program" (Soveschaniya 1899, p. 223)).

The Moscow conference of 1899 was hardly anything exceptional: Shcherbina (1908), for example, writes about a conference in the Kiev school district in 1898, noting the similarity between its proposals and those made in Moscow. However, it was the national "imperially sanctioned" commissions of education ministers N. P. Bogolepov (Trudy 1900) and P. S. Vannovskii (Trudy 1901) that turned out to be more influential.

The ministers' commissions, like the district commissions, occupied themselves, naturally, not only with mathematics: other subjects, as well as general administrative issues, were also discussed. However, the overall structure of education, with its many different types of schools, was usually not questioned. Consequently, curricula for gymnasia of different types (with one or with two classical languages), for real schools, and for other secondary educational institutions, including new types of educational institutions, were discussed separately.

Probably the most important change proposed by Bogolepov's commission was the introduction of elementary analytic geometry into the secondary school course, which indeed was not accomplished without resistance. For example, the well-known physicist O. D. Khvolson objected to it, as well as to "carrying over any courses whatsoever from the university to the upper grades of secondary schools" (Trudy, vypusk 1 1900, p. 340). The mathematician P. A. Nekrasov, who at this time was the supervisor of the Moscow school district, proposed that instead of analytic geometry, students study the classification of methods for solving compass-and-straightedge problems, which "was first splendidly developed, specifically for secondary schools, by Professor Paulsen [probably Julius Petersen was meant] of Copenhagen" (p. 342). The chair of the subcommission on mathematics, N. I. Bilibin, responded that such a classification was of interest only to those students who would go on to study mathematics in the future. As for objections to carrying over university courses into the schools, his response was that "this pertains not to university-level analytic geometry, but to episodes from analytic geometry, which are important not so much for mathematicians, as for lawyers and doctors, who very often must represent various changes by means of curves" (p. 343).

With regard to the decisions of Vannovskii's commission, Shcherbina (1908) expresses his views in radical terms:

> Both the position and the teaching plan are interesting in only one respect, namely, because they demonstrate how not to conduct a reform of the schools, and in general, what kinds of absurdities one might come to when attempting a transformation of the schools if one is little acquainted with pedagogical matters. (p. 53)

And in fact, P. S. Vannovskii, who had not long been minister of education, and who had been a minister of war prior to that, in attempting to establish a single type of school that would provide a general education, desired to make excessive cuts in the school course in mathematics. Two aspects of the commission's work, however, must be noted: its attention to the foreign experience and the views expressed both during the criticism of the Vannovskii's commission's proposals and during the general discussion.

A large part of the volume containing the documents of Vannovskii's commission is taken up by descriptions of how matters stand – both administratively and pedagogically – in other countries: Austria, Hungary, Germany, France, Belgium, Great Britain, the United States, Norway, and Sweden. These chapters are not equal in length (France gets 30 pages, Sweden gets 5) and are devoted mainly to teaching plans and curricula, with changes that were relatively recent at the time of the writing also being noted, for example, the chapter on the United States details the work of the Committee of Ten and the Committee of Fourteen.

Reports about foreign practices were regularly published in the process, and reformist proposals were also communicated. Two publications may be mentioned here. An article by K. M. (1900), initially published in the navy's journal *Morskoy sbornik* ("Naval Collection") and then reprinted as a separate monograph, focused on John Perry and the reforms he proposed. After relating Perry's proposals – scrupulously and with numerous quotations – the author described the responses to them as well and concluded by expressing support for experimental teaching in Russia.

Bilimovich (1907) writes about Germany, devoting one article to Felix Klein and another to the Meran program. After going over Klein's biography and some of his central pedagogical ideas (first and foremost concerning the introduction of basic higher mathematics into the secondary school program), the author sums up his findings: "At the present time, reforms have already established quite deep roots in the teaching of mathematics, but of course their full significance will be felt only after some number of years" (p. 27). Bilimovich describes changes in curricula in Germany and asserts that:

> Thus matters stand not only in Germany, France, and Great Britain. Austria, Italy, Spain, Sweden and Norway, the Northern and Southern United States, Japan – all of these countries are tirelessly working on the design of mathematics education. (p. 28)

The implication is clear: Russia must work on mathematics education as well.

N. Zavadskii's (1904) report at the Third Congress of Russian Experts in Technical and Professional Education in Russia, which garnered a certain amount of public attention, also draws on the foreign experience: "It is immediately apparent that the design of mathematics education in Austrian educational institutions is on a much higher level than it is in our schools," he writes; he goes on to say that "in Swiss schools, mathematics it as on an even higher level"; and he concludes that "in France mathematics is on a still higher level in secondary educational institutions" (pp. 21–22). However, he does not stop at lauding foreign experience: large part of his presentation is devoted to the description of his own successful teaching based on the experimental approach; he also stresses the importance of introducing the ideas of higher mathematics.

The responses to Vannovskii's commission's programs quoted by Shcherbina (1908) also contain many reformist ideas. Perhaps the most important article is the one signed with the initials S.P.[3] (1902). This article stresses the fact that mathematics education is often limited to the "mechanical work of computation or artificial complicatedness." The author stresses the role of functional dependence in mathematics and argues for introducing elementary differential calculus, the study of infinite series, and elementary analytic geometry into the school curriculum, while at the same time discarding superfluous ballast (which in his view includes, e.g., Diophantine equations and the binomial theorem (Shcherbina 1908, pp. 66–67)).

Similar views were expressed in various publications and at various congresses, conferences, and meetings. Mathematical societies, which had appeared by that time, also expressed support for reforms. A plan prepared by the Kiev physics-mathematics society states:

> If even in properly functioning Western European schools the teaching of mathematics has proven to be inadequate in terms of meeting modern demands, then there is an even greater need for a transformation in the educational program of Russian secondary schools, which under the influence of extremely unfavorable external conditions, as well as the hasty and not always beneficial changes introduced in recent years, are today in a state of disorder. The need for reforms in Russian secondary schools has been felt for a long time. (p. 130)

The desired reforms, however, did not take place.

3 The Creation and First Steps of the Russian Subcommission

The history of the Russian subcommission begins with Felix Klein's letter to the head of the Scientific Committee of the Ministry of Education Nikolay Sonin on January 24, 1909. The letter was written in German, but translated into Russian, and read at a meeting of the Scientific Committee on January 19 (Old Style). The letter stated:

> Highly Esteemed Colleague! You are, of course, already aware of the enterprise whose plans I am enclosing with this letter, in two copies. Having corresponded about the matter with my Russian colleagues, with whom I have the closest personal relations, I have the honor of requesting you, Esteemed Colleague, on behalf of the Central Committee of the International Commission on Mathematical Instruction, to see fit to take this matter into your hands, since it concerns Russia. (Delo 1909–1915, p. 21)

Klein then writes about what must be done, listing several key points. The most important of them are:

[3] Bychkov (1975) deciphers the byline: the author's name is Polyakov.

> 1) To secure the assistance of suitable individuals willing to work jointly with you as delegates from Russia. (I am informed by various correspondents that it would be advisable to choose all delegates from among St. Petersburg mathematicians.) 2) To organize a national conference with the aim of providing support to the delegates in their endeavors (p. 21). 3) To enter into communication with the government, in a timely manner if possible, so that it may subsequently not only confirm the delegates, but also put at their disposal the financial resources necessary for carrying out their work. (p. 22)

The letter concludes as follows:

> My own request to you is that you not only accept my proposals in general, but also inform me of the delegates you have in mind. Then I, on behalf of the Central Committee, will send an official letter to your government. (p. 22)

The minutes of the same meeting on January 19 further state:

> During discussion of this letter, the Chairman remarked that he does not consider it possible to decline Prof. Klein's proposal only because, due to his position in the Ministry of Public Education, he does not believe that he has the right to do so. On the one hand, the dignity of Russia, as a great nation, demands that it involve itself actively in international cultural work; on the other hand, his position as chairman of the Scientific Committee offers special advantages in terms of the practical realization of the congress's propositions. More than anyone else, he can be informed about the state of affairs in different educational institutions, and more quickly than anyone else, he can obtain all necessary information. (p. 22)

Indeed, the Scientific Committee was an organization that oversaw (at least to a large extent) issues pertaining to the content of education: it reviewed and approved textbooks and curricula (in all subjects). Sonin, a mathematician and a member of the Russian Academy of Sciences, served as its head from 1901 until his death in 1915. Thus, he would have been the natural person to approach. What is far more surprising is that Klein deemed it necessary to limit the membership of the delegation specifically to mathematicians from St. Petersburg. It is not clear on whose advice Klein made this request. One might speculate that it arose from the opposition between the St. Petersburg and Moscow schools of mathematics, but there were several other centers of mathematics in the country (even if they were not as significant, e.g., Warsaw, Kharkov, Kazan). We should note that the minister of public education at that time, Alexander Shvarts, to whom all the documents were sent for inspection, wrote on February 4 (Old Style), approving them, as follows:

> at the same time, I would ask you to discuss whether it might not be useful to have among the Russian delegates one of the members of the Moscow Mathematical Society, which has already been in existence for many years and which has demonstrated great interest in pedagogical questions pertaining to the teaching of mathematics in various educational institutions, and to apprise me of your decision. (Delo 1909–1915, p. 24)

Even prior to this, however, at a meeting of the Scientific Committee, two members of the Scientific Committee – both from St. Petersburg – were appointed as delegates in addition to Sonin, on Sonin's suggestion: B.M. Koyalovich, a professor at the Technological Institute, and K.W. Vogt, the director of one of St. Petersburg's *real schools*. Be that as it may, subsequently information about the activities of the commission was widely disseminated, and the most varied individuals connected with mathematics education were invited to collaborate with the subcommission (as Klein had himself suggested).

The correspondence between Sonin and Klein continued (Karp 2017). The names of the members of the Russian delegation were communicated to Klein and Fehr. At a meeting of the delegation (February 12, Old Style), a decision was made to invite Scientific Committee member V.I. Sollertinsky and Professor V.P. Yermakov of St. Vladimir University in Kiev to take part in subsequent discussions, as well as to approach all mathematical and other relevant societies about becoming involved. The second meeting, on March 12, 1909, was attended by V.I. Sollertinsky, and discussion focused on the makeup of the national subcommission. It was decided to invite two more professors (along with Koyalovich) from the St. Petersburg Technological Institute, Pavel Koturnitsky and Alexey Gattsuk; the inspector of St. Petersburg's Fourth (Larinskaya) Gymnasium, Pyotr Kolesnikov; two representatives from military academic institutions, Generals Zakhar Maksheyev and Mikhail Popruzhenko; two teachers from the Women's Pedagogical Institute, Nikolay Mikhelson and Zakhar Vulikh; the director of the Mezhevoy Institute in Moscow, Vasily Struve (to provide information about land-surveying academies); and Nikolay Bibilin, to provide information about religious academies. Finally, the name of Distinguished Professor Konstantin Posse of St. Petersburg University was added to the list in pencil (Delo 1909–1915, p. 57).

Shortly after this, the delegation prepared a preliminary report on the formation of the International Commission on Mathematics Instruction, accompanied by an announcement about the formation of the Russian subcommission. This text was printed in the *Journal of the Ministry of Public Education* (Sonin et al. 1909) and also published in offprints and then reprinted in other journals. It ended with the following remark:

> In making this announcement, the Russian delegates express their firm conviction that they will receive energetic and active support in fulfilling their duties from professors and teachers of mathematics and related sciences (mechanics, physics) in educational institutions of various types and departments. (p. 46)

And further, individuals wishing to participate in the preparation of reports were invited to get in touch with Sonin.

Offprints of this report were sent (on April 17, 1909) to a number of prominent figures in mathematics education (in accordance with the list previously discussed by the delegation), along with the following letter from Sonin:

> In view of the desirability of your active participation in the Russian national subcommission, the Russian delegation has instructed me to ask you to accept a membership in the subcommission. In addition, I consider it important to let you know that, for the delegation's preliminary considerations, it would be very important to receive from you as soon as possible some indication of those questions among the ones listed in the enclosed brochure concerning which we may hope to receive a comment from you for inclusion in the general report. (Delo 1909–1915, p. 25)

On April 18, letters were sent to the deans of the mathematics departments at all universities (along with offprints of the preliminary report and the proposal to reprint it in university editions).

> In view of the desirability of the active participation in the national subcommission of representatives of the mathematical sciences residing in different parts of the Russia and interested in the questions listed in the enclosed brochure, the Russian delegation has instructed me to invite the university's physics-mathematics department to appoint two members to the subcommission. (p. 35)

Around the same time (on April 16), Sonin also sent letters to all supervisors of school districts:

> In view of the desirability of enlisting as many collaborators as possible to fulfill the duty incumbent upon the delegation, I have the honor of humbly requesting you, Kind Sir, to assist us in distributing information concerning the aforementioned international undertaking by reprinting the enclosed brochure in the newsletters published by the Regional Directorate. (p. 47)

Sonin also used these letters as an opportunity to collect necessary information, and he asked the supervisors to report how many hours were devoted to arithmetic, geometry, algebra, and trigonometry in teachers' institutes and seminaries, on which programs instruction was based, and which textbooks and problem books were being used (such surveys of educational institutions, however, had been regularly conducted previously as well).

Finally, on April 18 Sonin sent analogous letters to mathematical societies (in Moscow, Kazan, Kharkov, and Kiev), inviting each to appoint two members to the Russian subcommission.

The letters that were sent were hardly unexpected. Information concerning the formation of ICMI had already appeared in the Russian press. Thus, Professor Dmitry Sintsov (1908) of the University of Kharkov published a report about the Fourth Mathematical Congress, in which he noted that, "on a motion by D. E. Smith and Archenhold, a resolution was passed, initially by a subpanel, and subsequently at the final meeting of the congress, to instruct F. Klein, Greenhill, and Fehr to organize an international commission for the comparative study of programs and methods used for teaching mathematics in secondary schools in different nations" (p. 80).

Or, for example, the brochure by Nikolay Volodkevich (1910) presented a report delivered by him in March 1909 (i.e., before the work of the subcommission had become visible), which contains the following passage:

> Finally, at the international mathematical congress which convened in Rome in April 1908, on a motion by D. E. Smith, professor at Columbia University, an international commission was formed for studying methods of mathematics education. [] This is a momentous decision. It reveals the importance attributed to the improvement of mathematics education at the present time. (p. 7)

The invitations sent out by Sonin met with a variety of reactions. Sonin's letter was read at a meeting of the Kharkov mathematics society on April 29, 1909. As the brief minutes of the meeting relate (Zasedanie 1910, p. 299):

> Those present expressed a wish for the aforementioned issues to be discussed at the sessions of the upcoming congress of experimental scientists and physicians in Moscow at the end of the year, for congresses of the national subcommission to take place, and for the resolutions of the Kharkov Mathematics Society to be sent to this subcommission, to whose meetings representatives of the Mathematics Society should be delegated for supporting the resolutions passed there.

The supervisor of the Kharkov district saw fit to jab the administrators from the capital slightly, noting that there was no need whatsoever to reprint the text from the *Journal of the Ministry of Public Education* in local periodicals, since the everyone received the Ministry's Journal, while no one read the local periodicals. Instead, he proposed to print in them only a notification about the article in the Ministry's Journal (Delo 1909–1915, p. 49).

In a letter sent in response, the University of Kharkov went even further than the Kharkov Mathematics Society (which also, however, clearly demanded a greater role for its representatives). The dean of the University of Kharkov, Mr. Gruzintsev, asked directly what the role of the elected delegates would consist in and how much discussion would be devoted to the general report (Delo 1909–1915, p. 49).

The St. Petersburg delegates responded to such attempts quite sharply. At a meeting on October 22, 1909, it was noted that:

> In the opinion of the delegates, there is no room either for the expression of subjective views or for debate in the execution of this task [the publication of the report]; the delegation's general report must represent a mosaic, each of whose separate parts must be executed as thoroughly as possible. Under such circumstances, given that the general report will be submitted on behalf of the delegation to the international commission, it is difficult even to understand what a discussion of the report, which the department finds so desirable, might consist in. Resolved: to reply to Mr. Gruzintsev in this manner. (Ob uchastii 1909–1916, p. 14)

In a letter from April 24, 1909, the president of the Moscow Mathematics Society replied that the decision would be made by the society at its fall meeting; however, he promised to reprint the received brochure in the Society's journal *Matematicheskii Sbornik* (Mathematical Digest) (Delo 1909–1915, p. 52). Some invited mathematics educators refused to participate actively; among these, for example, was Professor Yermakov, a prominent figure in education, who did, however, express interest in reading the reports prepared by the delegates themselves, which would presumably not be too difficult for them to prepare (this was clearly a gibe), since they (by contrast with Yermakov) were members of the Scientific Committee (p. 34). Sonin expressed apprehensions to the effect that those appointed as representatives by districts and universities would remain merely nonparticipating observers and would not take on the key task of writing parts of the report (Ob uchastii 1909–1916, p. 12). But these apprehensions turned out to be unfounded: a substantial number of people (although, naturally, not all those invited) convened at the announced meeting on November 21, 1909, at which the schedule for completing all of the tasks and their distribution among different authors was discussed (Delo 1909–1915, p. 83). Significantly, all of this work, including this meeting itself, was financially supported by the Ministry (see, e.g., Delo 1909–1915, p. 53).

We should note that the subcommission's work did not remain unnoticed (and not only because the announcement prepared by the Russian delegation was published, as has already been mentioned, in many places). Already in November 1909, the mathematician Sergey Bernstein, who would later become a member of the Soviet Academy of Sciences, wrote about the creation of the subcommission in an article about changing the mathematics curricula of secondary schools. Noting that "in all cultured countries, one can observe a persistent need for radical change in the programs and method of teaching mathematics," he welcomes D. Smith's proposal to create an international commission that would "make it easier for each country to make use of the global experience" (Bernstein 1909, p. 372). Further, he reports that N. Ya. Sonin, academician and head of the Scientific Committee, has been invited from Russia, and that Sonin as well as B.M. Koyalovich and K.V. Vogt "have been approved by the Minister of Public Education as Russia's delegates to the international commission"; he describes the plan of the commission's work, which has been translated and published in Russian, and the goals that its Central Committee has set before the national subcommissions ("to investigate modern trends in mathematics education in different countries and to publish a general report about them"); and he emphasizes that "the Central Committee gives a quite detailed list of subjects regarding which it would be desirable to have reports. The proposed program touches on all the issues that preoccupy our Russian teachers-mathematicians as well." Concluding this section of his article, Bernstein writes:

> The Ministry's sympathy with this international undertaking offers reason to hope that it will be guided by the results of the commission's work in carrying out reforms as well, and that it will also pay close attention to the preparatory activities of our mathematical and pedagogical circles, without whose active participation in all countries, as the Central Committee rightly notes, the enormous problem laid upon to the commission by the Rome Congress is absolutely insurmountable. Thus, it may be expected that, beginning in the next academic year, the activity of our pedagogical circles will further intensify, and their significance will become manifest not only in a more deliberate approach to their work by their members, which in and of itself would already justify the existence of these circles, but also in that influence which the united efforts of mathematics teachers can exert [to bring about] the rational gradual transformation of educational programs and methods. (p. 374)

The work of the subcommission was thus expected to arouse and intensify the activity of Russian mathematics educators.

4 The Publications of the Russian Subcommission

The Russian delegation's main task was to prepare reports (or rather, a single report, consisting of several parts). Publication was financed by the Ministry, which covered not only typographical expenses (each part was to be printed in 200 copies), but usually also a translation – as a rule, into French, but, for example, Vogt (1911) was written in German. Publication expenditures were estimated at approximately 3500 rubles (Delo 1909–1915, pp. 178–179). In reality, the number of copies printed was sometimes greater than and sometimes less than 200 (pp. 129, 133).

The initial plans were clearly more ambitious than what eventually proved possible. At a meeting on November 21, 1909, for example, the proposal was made to ask the famous shipbuilder and later academician Alexey Krylov and Professor Pavel Somov to write about the Naval Academy and also to ask the prominent mathematician and public figure Alexander Vasilyev to write about the teaching of mathematics at the so-called Pedagogical Academy (p. 83). A letter to Vasilyev containing a request to write such a report has even survived (p. 95). These and certain other reports, however, were never written.

Moreover, a report was prepared by the geometrician Venyamin Kagan (who in Soviet times would become head of the geometry department at Moscow University) on the subject of teacher preparation (the report consisted of a translation into German of a portion of Kagan's report at the First Russian National Congress of Mathematics Teachers, which will be discussed below). This report, however, was neither printed nor sent out: by 1915, when it was prepared, "printing a German translation at the present time" was found to be "inconvenient" (Ob uchastii 1909–1916, p. 65).

First to be published, already in 1910, was the *Rapport sur L'Enseignement des Mathématiques dans les Écoles de Finlande* (1910). It was followed by a report on universities and technical institutions of higher learning by Possé (1910). Last came a brochure about higher institution for women by Mlodzeyevsky [Młodzievsky][4] (1915). Brochures about elementary schools and gymnasia for boys (B.S. and Kondratiev 1911), female education (Mikhelson, Goriachev [Goriatchev], Koturnitsky [Kotournitzki], Gattsuk [Hartzouck] 1912), real schools (Vogt 1911), and military academies (Popruzhenko [Poprugenko] and Maksheyev [Makcheyev] 1911) were published as well.[5] The list of reports prepared by the Russian commission that was published in *L'Enseignement Mathématique* also includes unpublished papers, among which are Kagan's report and several other studies, including ones by Boris Koyalovich, Vasily Struve, and Dmitry Mordukhay-Boltovsky.

The reports are written in different ways. For example, the part of Popruzhenko and Maksheyev (1911) written by Popruzhenko takes up 14 pages and contains the following short sections (these titles are translated from the French):

- General characteristics of cadet corps
- General overview of the course in mathematics in cadet corps; the number of hours allocated to the course in mathematics (curriculum of 1898); method
- Arithmetic
- Algebra
- Geometry
- Trigonometry

[4] Here and below, in references to brochures, transliteration of names is given in two variants, following current transliteration rules in English and also in forms employed previously for publication in French.

[5] We cite the published brochures here. In the list published in *L'Enseignement Mathématique* (Commission Internationale 1920–1921), specific parts of these brochures are listed.

- Analytic geometry
- Curriculum of 1903
- Arithmetic
- Algebra
- Geometry
- Trigonometry
- Analytic geometry
- Number of hours
- Testing the curriculum in practice
- Plan for a new curriculum
- Approved textbooks and their use
- Testing; exams
- Outcomes of mathematics education

For comparison, the text by Vogt (1911) also fills up 14 pages and contains the following sections:

- Introduction
- Mathematical subjects
- Assignment of hours allocated to mathematics
- Teaching plan
- Arithmetic
- Algebra
- Geometry
- Trigonometry
- Elementary analytic geometry
- Elementary infinitesimal calculus
- Teaching plan for commercial divisions
- The aims of mathematics education
- Proofs
- Teaching methodology and educational literature
- Teacher preparation

As can be easily seen, both papers devote considerable space to descriptions of curricula, but Vogt probably offers more general views and judgments. For example, he explains that the goal of mathematics education is to develop thinking ability and the imagination, which may be achieved both "by developing theoretical knowledge and by using this knowledge to solve problems" (p. 11). Critical notes can be heard in his text: he writes that geometry textbooks have not gone far beyond Legendre's and that modern geometry has exerted almost no influence on them; that models are not used at all in plane geometry, but only in solid geometry; and that no practical work is required, such as independent preparation of models, but on the other hand, that many compass-and-straightedge problems are solved (p. 14). In another place, he notes that the university education required in order to become a teacher does not provide any knowledge of pedagogy, for which reason during the first years, teachers are completely unprepared for it (p. 16).

On the other hand, the second part of the brochure by Popruzhenko and Maksheyev (1911) consists of a note by Maksheyev about courses for preparing teachers for cadet corps at the Pedagogical Museum in St. Petersburg: it takes up fewer than four pages, is not divided into subsections, and amounts to a general description of the functioning of the courses. The unprinted brochure by Kagan mentioned above (whose contents will be discussed below) was, as far as can be judged from the text of his report at the congress, written in a different style.

In concluding this section, we should note that the subcommission's publications, even though they were not fully realized, undoubtedly constitute an important and insufficiently studied source on the history of Russian mathematics education (Karp 2018).

5 The Russian Subcommission and International Meetings

Listing the publications of the Russian subcommission, we have already reached the year 1915. In actual fact, between the year when the subcommission was established (1909) and what was effectively the last year of its work (1915), a great deal happened. For convenience of exposition, in this section we will focus on interactions between the subcommission and ICMI and first and foremost on the international meetings in which Russian representatives took part, while in subsequent sections, the discussion will concentrate mainly on Russian meetings, congresses, and publications. It must be borne in mind, however, that there was an inseparable link between what took place in Russia and beyond its borders.

The first thing to note is that the membership of the subcommission changed over time. Vogt was ill, and in 1913 he died, so on February 11, 1914, Sonin sent the Ministry a letter requesting that Actual State Counselor K.A. Posse, a distinguished professor at St. Petersburg University and a member of the Scientific Committee, who was already a member of the Russian subcommission, be given Vogt's place as a delegate (Delo 1909–1915, p. 281). In 1915, Sonin died and Posse became head of the subcommission; on April 15, 1915, already in this capacity, he wrote to Minister of Education Ignatyev with a request to approve Dmitry Sintsov as a delegate, since he "has taken active part in the work of the Russian national subcommission" (Ob uchastii 1909–1916, p. 63). The approval was received less than a week later (Delo 1909–1915, p. 286).

Sintsov was indeed probably the most active member of the Russian subcommission. Already in 1911, when Vogt and Koyalovich were supposed to attend the Milan meeting of the International Commission and Vogt fell ill, Sintsov went in his place (Delo 1909–1915, p. 239), thus becoming the subcommission's de facto representative. He had attended the commission's first meeting in Brussels as well, and he had written a special note about it (Sintsov 1910a, b).

In this note, Sintsov mainly lists what happened in Brussels while he was there (he left before the closing of the exhibition), beginning, however, with a description of his 2-week visit to Göttingen, where he had the opportunity to listen to Klein on the changes taking place in Germany (it is noteworthy that also in Göttingen he heard a report by the prominent Russian mathematics educator A. R. Kulisher about the latter's impressions of German schools which he had visited). Sintsov lists the German publications published as part of the commission's work, and he notes that on the whole, in the opinion of those attending the meeting, the preparation of reports was proceeding in a satisfactory manner. Sintsov himself was probably most interested in three topics: introducing elementary higher mathematics into schools (here he notes that in Russian real schools, military academies, and secondary technical schools, this has already been done); revising the course in geometry, introducing the idea of transformations, etc.; and, last, using models. He writes about all of these things, painstakingly listing what took place both at the meeting of the members of the commission itself and at accompanying events.

The meeting in Milan was far more representative than the one in Brussels. It was attended, as has already been said, by Sintsov and Koyalovich. Both left official (or semiofficial) reports for Sonin, the Chairman of the Commission, as well as published accounts of what took place in Milan – Sintsov (1911a).

Boris Koyalovich (n.d.) lists day by day what transpired at the meetings. He notes the important topics discussed in Milan, including rigor in the presentation of mathematics in secondary school, the fusion of different branches of mathematics in secondary school, and the mathematical preparation of natural scientists and engineers (on this last point, he himself had something to say, citing his Technological Institute as an example). But he also did not fail to describe the program's cultural part, so to speak, which included various official receptions and speeches, and an excursion on the Lago Maggiore that had been arranged for the guests, and which was "unfortunately completely ruined by the impenetrable fog and pouring rain" (p. 8).

He allots an important place to accounts of the work of the national subcommissions. Koyalovich clearly sympathizes with the presentation by Veronese, who made what he calls an important objection against the program of studies established by the Central Committee, to the effect that "the commission has deviated from its initial goal, and leaving aside the development of general principles which must inform the teaching of mathematics, has confined itself only to studying the current organization of such teaching in different countries" (pp. 2–3). This view, however, did not meet with support, and later Koyalovich noted with evident disapproval that "all orators spoke not about the methodology that should be followed, but about the methodology that is established in their schools" (p. 4). Koyalovich reported that:

> it became clear that certain subcommissions had already completed their work, for example, the French subcommission, which has already published a complete overview of the teaching of mathematics in all schools in five volumes. The works of the German subcommission were quite incomplete (even though it has already published 18 issues), since it intends to give a full overview in 40 (!) issues. The complete absence of information about the works of the North American subcommission, none of whose members were in attendance, came as an unpleasant surprise. (p. 3)

About the Russian commission (which had clearly done less than the German and the French), Koyalovich reported that "the seeming delay in the appearance of its reports is due to the need to translate the presented reports from Russian into French" (p. 3), after which he "listed the reports that have not been published, the reports that have already been translated into French (ready for publication), as well as other reports presented to the subcommission, and stated his expectation that the subcommission's work would be completed within a year" (pp. 3–4).

Koyalovich wrote:

> During the discussion of preparatory work for the congress in Cambridge, I expressed my opinion that our commission's work could be far more successful if the questions submitted for general discussion were better prepared. Using the issues of the mathematical preparation of engineers and the fusion of different branches of mathematics as examples, I explained how in my view they ought to be prepared so that our reflections about them would not remain unproductive due to excessive generality and the ambiguity of the questions raised for discussion. My opinion was recorded in the minutes and, it appears, met with approval by most of the congress participants. (pp. 7–8)

In conclusion, he expresses himself even more decisively:

> Summing up, I must mention the fact that the congress's work was, in my opinion, poorly prepared. The main fault lies of course with the central committee, which did not sufficiently prepare the questions submitted for discussion, and did not give delegates specific instructions about the kinds of information that it wished them to provide, as a result of which certain delegates spent a great deal of time repeating that which has already been printed in their reports. In addition, the fact that the time frame allotted for the congress was clearly too short (only three work meetings) also had an influence. [Participants] were forced constantly to rush and cut debates short exactly at the moment when they would become interesting. (p. 9)

Sintsov's reaction was far more favorable (Sintsov 1911b). He describes Veronese's critical presentation as being due to the fact that Veronese had been passed over when the delegation was being selected. He agrees with Veronese (and with Koyalovich) that "the whole work of the Commission amounted merely to a description of how things stand, and this is undoubtedly something very important and useful, but it would be desirable to figure out also how things should be." But he at once notes that "this can hardly be done by a Commission, let alone an international one. It is rather a subject for journal studies and a topic for discussions at congresses such as our upcoming teachers' congress," and he further adds that it is the work of the future (p. 2).

In his presentation in Milan, he noted:

> the revival of interest in pedagogical questions that is noticeable in Russia, and as if an awakening of the population of teachers, which manifests itself in the work of societies that are wholly or in part mathematical-pedagogical (math circles in Moscow, Warsaw, Riga, our mathematics society, and the one in Kiev), and finally in our own upcoming congress, which in essence serves the same purpose as the international commission. (p. 1)

As for the task facing the Russian commission, he describes it as follows:

> We have compiled a digest of what we have for the Commission, and we must ourselves use the Commission's work to acquaint Russian pedagogues with the character of teaching in

> the West: the enormous reports contain much that is of little use to them, and they are also almost inaccessible. At the congresses themselves, I see the role of our delegates thus far as being mainly informational in both directions. And I seek to use the congresses both to establish channels of communication with foreigners and to obtain from them something useful for those organizations with which I have a connection. (p. 2)

Accordingly, in the body of the letter, he gladly names those individuals whom he invited to make presentations at the Russian congress of teachers of mathematics, those who promised to help him with books for the Pedagogical Library and for courses, and those with whom he was able to arrange an exchange of books.

The next important meeting of the International Commission took place in Cambridge during the mathematical congress of 1912. The congress took place in Klein's absence, as a result of which, as Sintsov put it (1912a), "the meetings of the International Commission lost a great part of their attractive force" (p. 133). At the same time, he notes a number of interesting reports, above all Runge and Smith (which was translated and published in the journal *Voprosy Experimental'noy Physiki i Elementarnoy Mathematiki* [Bulletin of Experimental Physics and Elementary Mathematics], Nos. 570–573). Clearly agreeing with Runge that "[m] athematics suffers from excessive specialization and cuts itself off from natural philosophy and experimental science," Sintsov notes that "[i]n Russia, the position of mathematics is almost the same. One must only note that it has been especially distinguished by its striving to give problems precision and to carry out each problem to its final numerical result, for which Chebyshev and his school (the "St. Petersburg school") deserve the credit" (p. 135).

Sintsov also writes about the work of the subcommissions, reporting that in ten countries the reports have been completed, and repeating that in Russia the delay was due to the need to translate the reports into French, a problem that did not arise in countries whose languages were accepted for general use (citing H. Fehr, who had reported on the state of affairs in Russia). Noting the enormous volume of work that had been done, Sintsov reports that it was decided to continue the Commission's work until the next congress.

At the congress in Paris in 1914, the Russian delegation was quite large. Posse (1914) counts nine Russian participants, while Polyakov (1914) as many as ten. Among them were the already mentioned M. G. Popruzhenko, Professor A. P. Polyakov of the Moscow Institute of Railway Engineers, State Council member N. P. Petrov, and others (Posse makes a distinction between those who *came* from Russia – who included all those named above and also Samuel Dickstein[6] from Warsaw, whom he mentions only by last name without giving his first name or place of employment – and those who had *registered*, whose names he does not give, referring to them, e.g., as "young mathematicians, sent by universities" (p. 200). Polyakov (1914, p. 258) reports that among them was, e.g., Nikolay Luzin, who would subsequently become one of Russia's most important mathematicians. It may be supposed that the individuals who were singled out were those who, as Posse

[6] Polish mathematician and public figure. For his biography, see http://www-groups.dcs.st-and.ac.uk/~history/Biographies/Dickstein.html

writes, had responded to the Central Committee's notifications about the congress, which he had sent out).

The information that was most important in terms of the subcommission's work was conveyed by Posse as follows:

> On behalf of the Russian subcommission, I reported to those assembled the reasons for which several reports have still not been published. In the account of the latest International Congress in Cambridge in August 1912, these reports appear under the heading of reports written in the Russian language and requiring translation into one of the four languages (French, German, English, and Italian) in which all of the Commission's reports will be published. I explained that after these reports were written, rather substantial changes occurred in the state of the agencies to which they pertain, for which reason some of them have at present lost their former interest, while others require radical revisions. As a result, of the seven reports named in the account of the Cambridge Congress, the Russian subcommission has decided to publish, after thorough review, only three: two pertaining to higher institution for women, and one pertaining to teacher preparation, which are of unquestionable international interest. On behalf of the authors of these reports, I have been authorized to announce that the reports will be completed in a timely manner. (p. 201)

Which substantial changes Posse is referring to is not quite clear.

The main issues discussed at the congress were "Outcomes achieved in the project of introducing elementary differential and integral calculus into the upper grades of secondary schools" (A) and "The place and role of mathematics in higher technical education" (B). Questionnaires on these topics were sent out; a response to them on behalf of the Russian subcommission was submitted by Posse; as he reports, he used as a basis a survey that he had conducted "among teachers of supplementary classes in real schools, professors of mathematics in higher technical schools, and individuals acquainted with the outcomes of elementary calculus instruction in cadet corps" (p. 199).

While speaking briefly and positively about the report by Beke (see Beke 2014), Posse nonetheless could not refrain from telling about a discussion that he had had concerning a certain distinction that was purportedly drawn in French textbooks between such functions as $f(x) = x^2$, in which one can find the derivative simply by cancellation, and therefore supposedly make do without the concept of a limit, and such functions as $f(x) = \sin x$, in which this cannot be done. "My interlocutor," Posse writes, "ultimately had to admit that this involves 'une sorte d'éscamotage' [a kind of sleight]. I have cited this example in order to show that even in the country of mathematics par excellence there are things that must not be imitated" (p. 203).

The discussion about teaching mathematics in technical institutions of higher learning spurred Posse to make the following passionate observation:

> For us Russians, it was especially interesting to find out whether in higher technical schools in other countries one could observe that abnormal attitude on the part of the students toward mathematical subjects which in Russia has assumed downright menacing proportions: the lack of attendance at lectures and practice sessions on mathematical subjects; hasty and superficial preparation for exams using notes and abridged manuals; and sometimes even methods that are used for obtaining a 'pass' for a semester or a satisfactory grade that are completely impermissible from a moral point of view, which the students regard as a natural means of fighting with professors' unfulfillable requirements; the

> conviction that most engineers will not need any knowledge of mathematical subjects in their future work anyway, and so on. (pp. 203–204)

It turned out, as Posse states, that nowhere else did anything of the kind occur. The root of the evil he himself clearly saw in the fact that the technician-students were overburdened with specialized subjects.

Posse concludes his article decisively:

> Summing up what the Parisian congress has given us, I must say that it has once again confirmed, with respect to question A, that the time has long come to rework teaching plans in mathematics in our secondary schools if we do not wish to fall behind other civilized countries in this matter; and with respect to question B, that for a Russian engineer, a more substantial mathematics education is necessary than that which is given by our higher technical schools. As for the masses that fill these schools, which lack sufficient preparation even in elementary mathematics, they have no need of the mathematics that is taught there either, but at the same time all of these masses do not belong in higher schools. They need technical secondary schools with a practical form of education. (p. 205)

The next meeting was to be held in Munich in 1915, but it was not destined to happen. It should be noted, however, that interest in the foreign mathematics teaching experience did not wane in Russia even during the war. This is demonstrated, for example, by Kulisher's (1915) publication in the newspaper *Shkola i zhizn'* ["School and Life"], devoted to mathematics at an exhibition in peaceful Switzerland. It is in no way formally connected with the work of the subcommission (the International Commission is not even mentioned in it). Nonetheless, the desire that had been expressed by Sintsov earlier – "to establish channels of communication with foreigners and to obtain from them something useful" – can be felt in this article as well.

6 Responses to the Commission's Work. The First Russian National Congress of Mathematics Teachers

Returning to the beginning of the Commission's work, we should once again note the numerous sympathetic responses in the Russian press. Naturally, the reform movement had existed even earlier (often drawing new ideas and finding confirmations for its own ideas from the foreign German, French, or British and American press); nonetheless, the work of the Commission undoubtedly gave it new momentum. Shokhor-Trotsky (1911), in his long article on the reform of mathematics education, which had a sequel (Shokhor-Trotsky 1912), examines the development of education as a general process, writing more about ideas than about countries; in a footnote, he writes straightforwardly:

> This article consists of a somewhat expanded and emended revision of a report which I delivered at the mathematics department of the Pedagogical Museum of Military Educational Institutions in 1910 in view of this department's interest in working on issues associated with the improvement of mathematics education, which were raised by the International Commission, which was headed by Klein, Fehr, and Greenhill. (p. 135)

The article by Mrochek and Filippovich (1910), published even earlier, concludes with an account of the formation of the International Commission and its resolutions. The authors write:

> All of 1909 passed in animated work. Leaving aside those nations in which reforms had been introduced even earlier (France, Germany, Italy, and Denmark), a number of others awoke from professional slumber and got down to business. New societies were organized, existing ones became more active, congresses started coming one after another; separate national commissions had already had time to publish a number of reports and other materials. This movement swept Russia as well. The Second Russian National Congress on Pedagogical Psychology passed a resolution in the spirit of the reforms sketched out here; similarly wide-ranging resolutions were passed by the First Russian National Congress of Teachers of City Schools. Lastly, the Mathematics Department of the Pedagogical Museum in St. Petersburg, which had already been intensively working on reforming school mathematics since 1907, in January 1910 embarked upon a series of reports on topics proposed by the International Mathematics Commission. (p. 202)

The article describes the reform movement in different countries and quotes and mentions Klein and Smith, Perry and Young, and numerous representatives from France. Russian attempts to carry out reforms – new curricula and projects – are also mentioned. The authors' tone is quite decisive: the article begins with the optimistic assertion that "The latest major successes of experimental psychology and pedagogy have demolished the old methods of mathematics education and have created a new method – the laboratory method" (p. 174). The material (content) of school mathematics, however, has in their opinion become hopelessly outdated: "It is necessary to launch a vigorous attack against the defenders of scholastic mathematics, and above all to demonstrate to them that *all of mathematics developed empirically*" (p. 174).

Not all supporters of reform went so far. Many clearly believed that it was necessary to work meticulously on each part of the curriculum, separating that which was outdated from that which still had value, to which end it would be useful to know what was being done in other countries. For example, Sintsov prepared a "Collection of Curricula and Instructions on the Teaching of Mathematics in Western Europe" (Sintsov 1911c), in which documents from several countries were published.

Kagan (1911) wrote a lengthy addendum to a translation of Borel's book *Elementary Mathematics*, in which he described the reform of mathematics education in France and Germany. Kagan does not say much about the Commission and sees it somewhat simplistically and imprecisely: "We suppose that it was specifically a desire for, as it were, global sanction for the reform project that led Klein, at the Fourth International Mathematical Congress, which took place in Rome in 1908, to introduce a proposal to organize a special international commission in order to study the organization of mathematics education in all cultured countries and the reforms that are deemed desirable" (p. XXXII). However, he cites numerous publications about the work of the commission, and most importantly, he actually does mention the most significant ideas of the reform movement, such as the recognition of the essential role of the study of functions. At the same time, his understanding of the reforms is not especially radical; at least, he reports that "While these heated arguments are going on in Germany, in France reforms have already taken place" (p. XXXII). The addendum concludes pointedly: "we have received reports that in St. Petersburg, too, even in spheres closely connected with the work of organizing secondary education, the tendency toward reform has been subject to thorough discussion" (p. XLVI).

One forum at which the tendency toward reform was definitely subject to thorough discussion – indeed, various different tendencies toward reform, expressed with different degrees of radicalism – was the First Russian National Congress of Mathematics Teachers, which took place in the winter of 1911–1912 in St. Petersburg. It was prepared by employees of the Pedagogical Museum of Military Educational Institutions in St. Petersburg, an important methodological center, whose role in the Russian reform movement we have already mentioned. The announcement of the upcoming congress began with the observation that "the aspect of mathematics which calls most attention to itself are its dry, old, and scholastic techniques. In light of this, the tendency toward reform is becoming universal both in Western Europe and in the United States" (I Vserossiiskii s'ezd 1911a, p. 93). Further, the announcement tells about the establishment of the International Commission and optimistically states that its work is nearing completion and that a general summary will appear already in 1911. Next, turning to Russia, the announcement reports that the Russian pedagogical world has also become interested in issues of mathematics education, which is why a group of professors and teachers in St. Petersburg have taken it upon themselves to convene a congress. A later report (I Vserossiiskii s'ezd 1911b) describes a meeting that took place on September 2, 1911, during which the director of the museum, General Maksheyev, was elected chairman of the organizational committee, while Professors Posse and Savich, as well as General Popruzhenko, were appointed as his deputies; V. R. Mrochek, F. V. Filippovich, D. M. Levatus became secretaries; D. E. Tenner became treasurer. The members of the organizational committee included many well-known figures in Russian education, such as Tatyana Afanasyeva-Erenfest, Alexander Vasilyev, Alexander Kulisher, Venyamin Kagan, Dmitry Sintsov, Semen Shokhor-Trotsky, and others (Popruzhenko 1912). Alexander Vasilyev became the chair of the congress.

The Proceedings (Trudy 1913) of the congress begin with an account of the work of the international commission and relate how the mathematics department, "wishing to participate as it could in preparing Russia for the Fifth International Congress on Mathematics, scheduled to take place in Cambridge in 1912, decided to take it upon itself to develop reports on topics suitable for submission to the Congress. The schema of these topics and the general guidelines related to their content appear in the International Commission's 'Preliminary Report', which was published by Mr. Fehr" (v.1, p. VI) – here a reference was given to a translation prepared by the Russian delegation. The Proceedings go on to indicate that the idea of convening a Congress grew out of discussions of these reports and that this idea was sanctioned and variously supported by the Ministry of Internal Affairs and the Ministry of Education, as well as the Ministries of Industry and Trade and the Directorate of Military Educational Institutions.

Published in the Proceedings of the congress was a large report by Sintsov (1913) about the work of the International Commission, which had not been delivered at the congress, but had been prepared after the congress had ended. Sintsov notes that at the congress it had been determined that participants were relatively well acquainted with the work of the Commission in Germany and in France, but most importantly he writes: “while previously I had certain reasons to question the interest of Russian mathematics teachers in the issue of the so-called ‘reform’ of mathematics education, now after the congress I know that if it does have its opponents, it has its supporters as well, who believe that it is necessary” (p. 2). In the report, Sintsov discusses in detail not only the commission as a whole but also many national subcommissions. He writes a great deal about the practical aspect of their work, describing the work that they have already done, but periodically he also addresses its substantive side, describing, for example, a debate taking place in Sweden concerning the role of mathematics in education – which should be functional and prepare students for practical life, in the opinion of some, or aim at developing cognitive abilities, in the opinion of others – or special attention paid to study of functions in some programs. Noting that the Russian subcommission had almost completed its work and that Russia had done what it needed to do for other countries, he calls on educators to use the Commission’s work more actively in Russia, by acquainting the Russian audience in detail with how mathematics education is organized in other countries and by pursuing Russian projects on the basis of existing models (e.g., he calls on educators to put together a critical-bibliographic overview of educational literature).

In one way or another, the work of the Commission was repeatedly mentioned, and even when it not written about directly, the fruits and directions of its work were kept in view. In a brochure published after the congress, Mrochek (1912) noted the large number of participants (1200 people had attended!) and the particular interest of the audience at the congress, and he continued:

> The interest and large number of people cannot be explained merely by the fact that this Congress is the first. It would be far more accurate to attribute this to two other factors: first, Russia, going through a process of renewal, has embarked upon the path of public organization, public and professional individual initiative; second, Russian educators, too, have felt the effects of that international movement in the sphere of school reform which is giving shape to contemporary mathematics pedagogy and concurrently binding together all of the disparate building blocks of school construction with one mighty cement – the harmonic cultivation of the personality. (p. 82)

The reports delivered at the general meetings included Mrochek’s own “Experimental Problems in the Pedagogy of Mathematics,” Filippovich’s “The Organization of the Teaching of Elementary Analysis in Secondary School” and Popruzhenko’s “Calculus of Infinitesimals in Secondary School,” A. N. Smirnov’s “Games and Exercises Facilitating the Development of Image Thinking and Imagination,” D. E. Tenner’s “Visual Aids,” A. R. Kulisher’s “The Elementary (Propaedeutic) Course in Geometry in Second School. Its Goals and Implementation,” and others, in whose very subject matter and titles one can already see the influence of the reform movement.

However, one should not think that, at the congress, unanimity reigned. The same V.R. Mrochek concluded his report with the words: “Strictly scientific mathematics is inaccessible to children," (Trydy 1913, v. 1, p. 95), which some presenters are unlikely to have agreed with – for example, I. I. Chistyakov, from Moscow, who proposed introducing elementary number theory into the secondary school course, which elicited objections, however, from V. M Kupershteyn from Yelizavetgrad, who talked about the absurdity of the "theoretical" requirements that existed in school arithmetic, such as defining the number one, and reminded those present in no uncertain terms about how they themselves, as children, had cursed the textbooks of A. P. Kiselev (who, in fact, was the honorary secretary of the meeting).

Tatyana Afanasyeva-Erenferst began her report on irrational numbers by saying:

> I must confess that if I were an admirer of the laboratory method and of limitless adaptation of the curriculum to the student, I would throw out irrational numbers from secondary schools altogether. But I espouse a different point of view: I believe that there are ideas, methods, skills, without which students cannot be allowed to graduate from secondary schools, and I prefer, on the contrary, that the student should be adapted to certain parts of the curriculum... with the aid of sufficiently carefully selected methods. (v.1, p. 254)

D. M. Levitus responded to this as follows:

> I count myself among the admirers of the laboratory method, but those admirers who would like to apply it reasonably, without any excessive enthusiasm. It seems to me that this method in no way contradicts the most rigorous proof of any proposition. I am certain that laboratory classes conducted in a reasonable way can lead students to the idea of irrational numbers. Moreover, I am convinced that only that student's understanding of irrational numbers will be clear who arrives at it not just by listening to the abstract reasoning of the teacher; the way to consciousness does not lie through the ears alone. (v.1, p. 266)

Colonel A. V. Poltoratsky cited foreign experience, remarking that the teaching of calculus does not always end up being successful: "At the present time, what we see before us is not any great cultural conquest, but one of those good intentions with which the road to hell is paved" (v.1, p.119). To which S. I. Shokhor-Trotsky replied: "That is not the issue; the issue is whether schools should become adapted to the interests of science and culture" (v.1, p.120).

Mrochek (1912) depicts the anti-reformers in a somewhat caricature-like manner:

> The [proceedings] did not pass without objections, but what objections! 'Graphs belong in geography and natural science, not in mathematics classes, because mathematics is a dry and boring subject,' said a director-mathematician from Moscow. But who is to blame for the fact that mathematics in dry and boring? Liven it up, make it interesting, connect it to natural science – and then your 'objection' will disappear like smoke. (p. 85)

And concerning a certain lady who said that by working with graphs on millimeter paper students might ruin their eyesight, Mrochek remarked that not every thought should be expressed out loud.

A separate word must be said about the report by V. F. Kagan, which had been composed, as he himself noted, "in close connection with my instructions from the Russian Subcommission of the International Commission on Mathematics

Instruction" (Trudy 1913, v.1, p. 479). However, he at once adds the disclaimer that the draft prepared for the congress is larger than the one prepared for the Commission ("Russian instructors might be interested in details that are completely superfluous in a report intended for the International Commission" (v.1, p. 480)). The report published in the Proceedings of the congress has, as he himself says, four parts (only the second was presented at the congress): a historical part (up to the time of the Congress), a part about existing agencies, a part consisting of considerations about the most effective way to organize teacher preparation, and last, a part devoted to the literature on the subject. It should be noted that Kagan's recommendations are quite moderate – in effect, he proposes offering pedagogical courses, including pedagogical courses at universities: "those disciplines which are not only indispensable to the teacher, but which, given their strict scientific character, are useful for general education in mathematics and naturally fit into the context of university teaching, must be included in the list of required subjects" (v.1, p. 549). As we see, his suggestions are quite general.

In general, although reformers formed a majority at the congress, the congress's resolutions were quite cautious. It was determined that it was necessary to increase students' independence and activities, to teach in a manner that utilizes visual observations, but at the same time to strengthen the logical component, while taking student psychology into account as well. It was deemed fit to omit from the course several questions of secondary significance, "to infuse the course with, and shine a bright light on, the idea of functional dependence, and also to acquaint students with the elementary ideas of analytic geometry and calculus, which are indubitably accessible to them, in order to bring secondary school education closer to the demands of modern science and life" (v.1, pp. 568–569). There were resolutions about improving mathematics preparation in women's educational institutions, providing for the needs of gifted and interested students, increasing the independence of educational institutions in determining teaching curricula, making universities increase their teaching of the basic subjects necessary to future teachers, and so on. At the same time, the concluding resolution urged caution in the implementation of the preceding proposals – it was recommended that special commissions should be formed, which would study all of these issues further.

At the congress's concluding assembly, the links to the foreign movement were once again emphasized: greetings were telegrammed to Klein, his active collaborator Gutzmer from Halle, and also to Charles Laisant, the editor of *L'Enseignement Mathématique*. From the other side, as well, an article about the congress was published in the journal *L'Enseignement Mathématique* (Sintsov 1912b).

Responses to the congress in the Russian press were numerous. The newspaper *Shkola i zhizn'* ["School and Life"] ran several pieces during and after the congress, including an overview by Filippovich (1912); *Pedagogicheskiy sbornik* ("Pedagogical Digest") published an article by Popruzhenko (1912). An article by Dmitry Mordukhay-Boltovsky (1912) was printed as a separate brochure. The published articles in turn became weighty documents in the struggle for the reform of mathematics education. Thus, for example, Mordukhay-Boltovsky (1912) not only tells about the congress and what happened during it but also lists what he refers to as the basic ideas of the new mathematics – from purely mathematical ones (functional dependence, infinitesimals, transformations) to connections with psychology, philosophy, and the history of mathematics. He devotes a separate section to the idea of functional dependence in secondary school (relying also on foreign experience) and another even to non-Euclidean geometry in secondary school. Models, graphs, and the propaedeutic course in geometry also each have their own section. In conclusion, Mordukhay-Boltovsky analyzes the congress's resolutions, sometimes criticizing them for their timidity, and on other occasions for their excessive decisiveness (the desire to equalize men's and women's education occasions doubts in him, since "Women's intellect is characterized by special characteristic features, which women can be proud of" (p. 42)).

In this way, discussions about the teaching of mathematics continued after the congress also. They found a new forum at the Second Congress.

7 The Second Russian National Congress of Mathematics Teachers

The decision to convene a Second Congress was made already at the First Congress, and it was immediately decided to convene it in Moscow. As in the case of the First Congress, there is a large literature concerning the Second Congress – articles were published both before the congress and after it – in *Russkaya shkola* ["Russian School"] (Bondarev 1914), in *Pedagogicheskiy sbornik* ["Pedagogical Digest"] (Popruzhenko 1914a, b), in *Pedagogicheskoye obozreniye* ["Pedagogical Review"] (Chlen s'ezda 1914; A.L. 1914), in *Vestnik obrazovaniya i vospitaniya* ["Herald of Education and Childrearing"] (Ushakov, 1914), in *Shkola i zhizn'* ["School and Life"] (Kulisher 1914a), and in separate brochures (Mordukhay-Boltovsky 1914), not to mention *Matematicheskoye obrazovaniye* ["Mathematics Education"], the journal of the Moscow Mathematics Circle (Chistyakov 1914; Chlen Vtorogo s'ezda 1915).

The congress took place from December 26, 1913, until January 3, 1914. The chair of the organizing committee was B. K. Mlodzeyevsky, while M. Popruzhenko served as the chair of the congress itself. The first report was delivered by Dmitry Sintsov. It was devoted to the International Commission on Mathematics Instruction and was mainly informational in nature: Sinsov talked about the history of the commission, on the one hand, and about work on reforming the course in mathematics in different countries, on the other. He noted that:

> Now we have, for a number of countries, a summary of up-to-date and verified materials, prepared with great love and diligence, which makes it possible to evaluate the character of mathematics education in a country, to compare, to assess contemporary tendencies, and to draw conclusions about the greater or lesser degree of suitability of various undertakings, which have already been tried out elsewhere. And this has enormous significance especially in the sphere of mathematics education, which appears to outsiders as something frozen, dead, dry, and cold. (Doklady 1915, p. 8)

Sintsov clearly sees the continual development of the course as an objective of paramount importance. At the same time, he concedes that “it is impossible to propose a single universally applicable method of teaching, a single flawless plan” (p. 8). Some will not develop enough for such a plan; others will quickly pass it in their development.

Other presenters noted the commission’s rousing and steering influence (e.g., A. K. Vlasov, who followed Sintsov with a report on the value of elementary mathematics for general education). In general, presenters spoke a great deal and often about the international experience. Note, for example, the presentation by Professor N. Saltykov of Kharkov on the preparation of teachers for secondary schools or the report by I. Chistyakov of Moscow “On Foreign Journals for Those Who Teach and Those Who Are Taught.”

In his “Recollections of the Second Russian National Congress,” which were published over a year after the congress had taken place, the author, who signed himself as a Participant in the Second Congress (Chlen Vtorogo s’ezda 1915), remarks:

> The general theme [of the presented reports] was somewhat different than at the First Congress. Indeed, during the First Congress, a whole series of presentations insistently recommended grounding mathematics education in the findings of experimental pedagogy and the laboratory method. Despite the interest of reports of this type, this tendency did not meet with great success at the First Congress. And at the Second Congress, reports of this nature were completely absent; a presentation delivered by one of the participants of the congress, which recommended using the laboratory method in studying the numbers from 1 to 1000, cannot be said to have been successful. The main theme of the Second Congress, as it appeared to its participants, was a different one, namely, bringing science and teaching closer together, introducing scientific elements into the sphere of education, increasing teachers’ own scientific education by familiarizing them with the level attained by contemporary science. (pp. 1277–1278)

Indeed, although certain pedagogical innovations were discussed – in such presentations as D. Volkovsky’s “On the Significance of Pictures in Elementary Arithmetic Education,” M. Voskresensky’s on the development of spatial thinking, or V. V. Petrov’s on practical assignments in mathematics – there was no separate general report on the laboratory method. Yet there was a special report (by S. Polyakov) devoted to the issue of reforming mathematics education from a methodological point of view, which addressed the laboratory method as well (albeit far more cautiously than certain presentations delivered during the First Congress had done so):

> The assimilation of methods of mathematical thinking undoubtedly requires a broad development of students’ ability to work independently, a broad program of exercise in the concrete application of methods, a broad dissemination of the labor principle and the “laboratory method,” greater convergence between mathematics and other spheres of human knowledge. It is necessary only to establish the conditions, means, and boundaries of the program of exercise and the “laboratory method” in the teaching of mathematics. (Doklady 1915, p. 165)

The presenter conceded that the exercises that might be offered to students in real-life situations will be practically pointless in terms of having a practical use, but in his view “pointlessness must be compensated for by the interest of independent work.” He fervently objects to “register” pedagogy, which relies on control:

> The usefulness of schoolwork must rest not on the problems of controlling students' work and not on their practical results, but on deliberate interest in the mathematical problems of science, on infecting the students with scientific creativity. (p. 166)

Polyakov explains that "The mathematical laboratory is found not in classes with manual labor, not in land-surveying work, but at the blackboard and in students' notebooks" (p. 166), and he goes on: "the center of gravity of the development of mathematical reasoning ability lies in the work of creative thought on abstract materials [although in the younger grades "intuitive instruments and 'concrete' exercises" are also needed]; this defines the conditions and boundaries of the laboratory method" (p. 167). And further, he voices apprehensions lest the development of the notion of functional dependence undermine the integrity of the assimilation of complex ensembles of conditions and concepts, or lest the propaedeutic course in geometry (which he considered indispensable) undermine the proper relationship between the empirical and the logical, causing learners to become, as he says, *frivolous* in their use of deductive reasoning.

What is undoubtedly true is that there were numerous reports at the congress which supported and developed another side of the reform movement: the reform of the content of mathematics education. S. N. Bernstein spoke about the concept of the function in secondary schools; D. Sintsov addressed teaching analytic geometry in school; A. R. Kulisher focused on the idea of motion in geometry and its applications in the school course; K. F. Lebedintsev discussed the theory of limits in the course on geometry; and so forth.

The resolutions of the congress were more decisive in form than those of the First Congress had been, but not significantly different from them. It was recognized that analytic geometry and calculus must be included in the secondary school course (to which end requisite measures were proposed, including improving the methodological preparation of teachers); that educational institutions must be given greater independence to change their curricula; and that mathematics education must be organized in women's educational institutions according to the same principles as in men's educational institutions. Measures were enumerated, which in the view of the congress were indispensable for improving the preparation of mathematics teachers (providing them, for example, not only with scientific, but also with general pedagogical preparation). A commission was established to address the question of organizing the teaching of mathematics in secondary schools; M. Popruzhenko, Z. Maksheyev, B. Mlodzeyevsky, A. Vlasov, D. Sintsov, and N. Saltykov were appointed to this commission and instructed to form subcommissions to prepare reports on the general principles and plans of teaching in secondary schools and on teacher preparation (Rezoliutsii 1914).

Naturally, the congress's resolutions were not supported by everyone and in every respect. Of note is an article by Posse (1915a), published in the official *Journal of the Ministry of Public Education*, and written, as it indicates, at the behest of the Minister of Public Education. It begins with a rather detailed account of the work of the International Commission and emphasizes the fact that "the issue of the reform of mathematics education, raised by F. Klein, now occupies the entire civilized world" (p. 24). Further, the author summarizes the idea of the reform: its point, in his view, is to acquaint learners with the ideas of functional dependence and the calculus, not by making a separate course out of these ideas, but by turning them into a pervasive theme of the course that already exists. In Russia, according to him, reformist ideas have found a welcome, but have not been put into practice fully (e.g., in gymnasia, by contrast with real schools); the elements of calculus are still not studied, and the ideas of analytic geometry remain unknown to learners until sixth grade. Posse does not support all of the congress's resolutions: he is not in favor of granting educational institutions the right to change their curricula; he proposes to postpone the question of equalizing women's and men's educational institutions until the question of men's institutions has been cleared up; he remarks that in omitting sections that have lost their meaning, as advocated by the congress, great care must be exercised, since such sections are, in his view, few in number. On the other hand, he is a convinced supporter of the bifurcation of education, that is, he insists on dividing it into two types: as we would say today, education with an advanced course of study of mathematics and ordinary education. As we will see, Posse's views met with a certain degree of support.

One of the resolutions of the Second Congress was to convene a Third Congress in Kharkov in December 1915, delegating its organization to the Kharkov Mathematics Society. This was not destined to happen. Initially, the Kharkov Society declined this assignment (Participant of the Second Congress 1915); this was followed by an optimistic announcement that the congress would take place after all, during the Christmas vacation of 1917–1918, in St. Petersburg, having been organized by the Pedagogical Museum of Military-Educational Institutions. There were even questions for discussion at the congress – its program (K sozyvu tret'ego vserossiiskogo s'ezda prepodavateley matematiki 1915). But by the end of 1917, events of a completely different nature were taking place in St. Petersburg.

8 Ignatyev's Commission and the Reform Movement

In January 1915, Count Pavel Ignatyev became head of the Ministry of Public Education. By April, he had convened a conference on school reform, which addressed such issues as the aims and problems of schools; the length of the school course; bifurcation (the formation of special sections and classes); which subjects should have exams; how much knowledge students should be expected to have in each subject; students' moral, physical, and aesthetic education; women's education; and the relationship between the school and the family (Soveschanie o reforme 1915). For the detailed development of the policies established at the conference, the Ministry formed a number of commissions, including a commission on mathematics instruction, which was headed by Konstantin Posse (while Dmitry Sintsov was one of its members). The proposals developed by this commission were subsequently published in the *Journal of the Ministry of Public Education* (Materialy po reforme 1915).[7]

The most conspicuous component of the project was the implementation of the plan for bifurcation; for grades four and up, four different versions of curricula and teaching plans were established: for the physics-mathematics branch of the real school division, for the natural scientific-historical branch of the real school division, for the new-humanities division, and for the classics-humanities division. In the physics-mathematics division, for example, we find a whole section on "Elementary Analytic Geometry and Calculus" in the final, seventh grade (to which 3 hours per week were allocated), which addresses continuous functions, derivatives, Lagrange's formula (mean value theorem) and using it to find the intervals of monotonicity of a function, and other topics. Nothing of the sort is to be found in the new-humanities division, let alone the classics-humanities division. In the algebra curriculum for the classics-humanities division for the sixth grade, we do, however, find the following:

> An understanding of constant and variable quantities, of independent variables and functions. An understanding of infinitely large and infinitesimally small quantities. The main theorems about infinitesimally small quantities. An understanding of limits. The main theorems about limits. (p. 278)

However, even the word "functions" is almost never used and certainly does not constitute a pervasive theme of the course.

The plan was received unenthusiastically. In a report prepared for the Moscow Mathematics Circle (which had carefully examined the proposed reforms and had formed a special Commission to study them – see Doklady 1916), Volkov (1916) expressed himself quite clearly:

> The programs printed in the Materials, which confine themselves to insignificant alterations of the currently existing programs, do not offer the solution to the question that Russian schools have been waiting for. [The schools'] expectations have been broadly formulated by the resolutions of the Russian National Congresses of Mathematics Teachers. These expectations did not arise from a wish to imitate fashion, an infatuation with the example of Western Europe. The debates that surrounded M. G. Popruzhenko's report at the Second Congress demonstrated that the abnormality of the existing organization of mathematics education is fully recognized, that reforms are necessary. But the Commission in its work has ignored all of this or has not deemed worthy of its attention either the example of France and Italy or the desires of Russian mathematics teachers. In the teaching of mathematics in new schools, everything must remain as it has been – that is the conclusion that one inevitably reaches after reading the *Materials*; in one set of secondary schools, the elements of higher mathematics will remain a superstructure on the building of elementary mathematics, not connected with its other sections, as they were in the curriculum of 1906, while in another set [of schools] they will remain the same unknown realm that they have been up to the present time. (p. 40)

In his presentation, Volkov stressed the role of the International Commission, and in particular cited the report of Beke, when speaking about the role of

[7] It should be noted, however, that the decisions were by no means always unanimous, as the publications that will be discussed below make clear (Volkov 1916), and moreover, that certain printed plans represented the opinion of a minority.

mathematics for all learners, and not just for future mathematicians and technicians, as a means of developing general cultural literacy (because humanities-oriented students of both of the described types clearly did not receive enough of "reformed" mathematics).

The criticism was wide-ranging. For example, *Materialy po reforme* (1915) stipulated that elementary geometry had to be included in elementary education (which undoubtedly constituted a reform). However, this was done in a quite cautious manner. The program states:

> The main purpose of giving students in the first two grades visual familiarity with simple geometrical concepts is to enliven and to refresh the educational material, offering the teacher an opportunity to assign problems with geometrical givens along with problems in arithmetic. (p. 247)

Quoting this passage, Nikolay Izvol'skii (1916) bursts into a rather lengthy ironic tirade, letting it be known that what is being offered here is merely a negligible banality. He makes the same charge against other sections of the program in geometry, noting, for example, that the attractive-sounding passage from the program of the classics-humanities division about mathematics as a logical system and axioms and theorems in mathematics will inevitably, due to a lack of time, be either too difficult for the students or turn into a general discussion that would be better left for parlor conversation.

It should be noted, however, that even this plan, which was criticized for its conservatism, was not destined to come to fruition. For the Russian monarchy, even half-measure reforms were unacceptable – at the end of 1916, Ignatyev left the post of minister. And less than a year later, the October Revolution brought the Bolsheviks to power.

9 The Postrevolutionary Period

Vlasov (1916), who has been quoted above, wrote that "the war has paralyzed the activity of the [international] commission and the very term 'international' has now begun to sound somehow strange" (p. 38). After the revolution, naturally, it became even more strange to talk about the International Commission on Mathematics Instruction in Russia. This does not mean, however, that its influence was not palpable.

Education was radically transformed (Karp 2010). Reforms were finally enacted, and indeed, these were no longer reforms, but a revolution. Its fundamental focus was not mathematics education, but pedagogy and organization: such individuals as the psychologist Pavel Blonsky, the party operative Viktor Shulgin, and Lenin's wife, Nadezhda Krupskaya, became the new pedagogical leaders; but these winners were joined by some of the older figures of the mathematics reform movement as well, and even more importantly, some of the reform movements' slogans turned out to be consonant with what was taking place, if only because changes in general were supported during this period.

The role of mathematics was seen in a new way: not as an independent subject, but ideally as part of the process of labor education (or the activity of the labor commune). No one remembered Polyakov's words at the Second Congress, cited above, concerning the uselessness of practical activity. The position of Ovsey Vol'berg, one of the most active figures in education during the early postrevolutionary stage, was representative. In an article entitled "Two Worldviews" (Vol'berg 1919), after clarifying that the members of the Moscow Mathematics Circle who polemicized against him were "locked within the bounds of self-sufficient scientific thinking, constructing abstract schemas in the solitude of their offices" (p. 84), he explained that mathematical abstraction did not precede practical application, but on the contrary emerged from it in a natural fashion. Consequently, teachers would merely have to get involved in "practical work in various spheres of the construction of life":

> And who will teach mathematics, who will teach physics, who will teach botany? No one. Recall that we have agreed that the teaching of subjects should have no place in schools. Every teacher-worker will apply mathematics, physics, biology, etc., at such times and to such an extent, in such contexts and to such an extent, where this is required for effective teaching. And only then. (pp. 84–85)

In another one of his articles, however, the same Vol'berg (1918) wrote that "the idea of functional interdependence is the linchpin that must give unity and stability to mathematics," that "it is necessary to underscore and insist on the connection between the origins of mathematics and the history of its development" (p. 15), and that students in upper grades must "become acquainted with the foundations of calculus and continue to study analytic geometry in close connection with the natural sciences" (p. 16). And in these exhortations, it is not difficult to hear the echoes of the international reform movement.

Later, too, one could read, for example, how beneficial it is to take children on a field trip to a sovkhoz (Soviet farm), since they were able to obtain a "vivid notion of functional dependency – the pulley of the electric motor, the rotation and motion of the threshing machine's parts" (Nazarenko 1926, p. 63). One could observe a peculiar combination of the idea of the labor school, developed on the basis of American progressive education, among other factors, and ideas evolved by the International Commission on Mathematics Instruction.

In 1931, it was announced that all of these postrevolutionary innovations had been leftist distortions, and the country began rapidly to return to proven textbooks from before the revolution, written by those who, like Andrey Kiselev, long before this had been censured for their conservatism (Karp 2010). We should merely note that, prior to this, Russia did nonetheless take part in a study, whose revival was initiated by David Eugene Smith, in which countries gave accounts of the current state of their own mathematics education. The report was written by the same tireless Sintsov (1929), who gave a description of how education was conducted after 1910. The following sentence, with which he concludes his description of the work of Ignatyev's commission, is worthy of note:

> I have described it only because it shows that even at that time there was a tendency to minimize the place given to mathematics in the curriculum – a tendency that has characterized the post-revolutionary period, although naturally people have given it a different theoretical explanation. (p. 97)

Further, he provides descriptions of programs that were in use after the revolution. But all of this was, of course, already incomparable in scale to the work of the Russian subcommission during the years 1909–1915.

10 On Certain Members of the Russian Subcommission

Klein had addressed Russian mathematics educators through official channels. Consequently, most of the members of the Russian subcommission had some kind of official status, or more simply put, they were all generals. The word “general” is used here not as a metaphor: in Russia there existed a system, which had been established by Peter I, in which all government employees had ranks corresponding to military ranks. The academician Nikolay Sonin – the chair of the Russian subcommission – had a rank of privy councillor, which corresponded to the rank of lieutenant general. The ranks of Karl Vogt, who was the director of a real school, and of Professor Boris Koyalovich of the Technological Institute, and of Professor Dmitry Sintsov of the University of Kharkov, and of Professor Konstantin Posse of St. Petersburg University, corresponded to the rank of major general. Zakhary Maksheyev and Mikhail Popruzhenko served in military institutions and were lieutenant generals.

However, the work of the Commission received a response from people who for various reasons occupied lower rungs on the official social ladder (in addition to which there existed another: the state councillor Andrey Kiselev, already mentioned above, whose rank was between that of colonel and major general, was on the other hand the author of the most popular textbook, and therefore exerted an enormous influence on teaching practice, and was far wealthier than many generals as well; see Karp 2012). Note that the list of active members of the Russian subcommission and individuals connected with it is a roster (albeit incomplete) of the most prominent figures in Russian mathematics education before the revolution. Their biographies, many of which are practically forgotten, have yet to be studied. Naturally, the life of Professor Sonin – prominent mathematician, supervisor of the St. Petersburg school district, chair of the Scientific Committee – has been researched quite thoroughly (Posse 1915b; Kropotov 1967). The same may be said about Sintsov, about whom dissertations were defended during the Soviet period (Borovik 1970). Karp (2017) provides some biographical information about these members of the commission and also about Koyalovich, Vogt, and Posse. Because it is not possible to discuss here a large number of educators associated with the commission and the reform movement, we will confine ourselves here to saying a few words about Mikhail Popruzhenko, Vasily Struve, and Alexander Kulisher.

The life of Mikhail Popruzhenko (1854–1917) is sufficiently typical of a mathematically gifted officer. He graduated from the Poltava military gymnasium (which for most of its existence had been known as the Poltava cadet corps – Pavlovskii 1890). Then he graduated from the Mikhailovskoye artillery school and then the artillery academy. Serving at various locations, Popruzhenko took part in the Russian-Turkish War of 1877–1878, but in 1881 he began working in military educational institutions, moving up through the ranks and getting promoted to higher and higher positions. By 1898, he had become appointed director of the Vladimir-Kiev cadet corps, and in 1905 he became a general for special assignments at the Main Directorate of Military Educational Institutions. In 1907, he was promoted for distinguished service to lieutenant general. Popruzhenko was by no means only an administrator: he was also the author of numerous textbooks and problem books, which enjoyed great success and were reprinted even after the revolution – for example, Popruzhenko (1922, 1939). More generally, he was a notable mathematical-pedagogical journalist, frequently writing articles for journals (in the *Vestnik opytnoy fiziki i elementarnoy matematiki* ["Herald of Experimental Physical and Elementary Mathematics"] alone, we can count 21 pieces of different lengths under his byline, including quite vehemently written). For example, the article Popruzhenko (1904) had the unambiguous title "Impoverishment" and began as follows:

> Lately, there has been an extraordinary lull in our educational-methodological literature: we see nothing new; only rarely does some arithmetic textbook come to light with new rehashings of old themes; and old acquaintances keep appearing, published for the twentieth or thirtieth time, in "improved and revised editions," occasionally greatly disfigured by new patches; all kinds of "detailed solutions and explanations of all problems" spring up like unwholesome mushrooms, and speculative ventures triumph in the form of an infinity of problem books and workbooks for competitive exams. (pp. 3–4)

Vasily Struve (1854–1912), on the other hand, as far as we can judge, left behind no large studies. He was the son of Berngard Struve, who had served as governor of Perm, and the brother of the political thinker and activist Pyotr Struve, who was at one time supposed to be known ideally by every Soviet student, since he was criticized extensively in the writings of Lenin. After graduating from the mathematics faculty of St. Petersburg University, Struve began working in the pedagogical field, serving as inspector of the Nikolayevsky Women's Institute in St. Petersburg, and in 1900 becoming the director of the Land Surveying (Mezhevoy) Institute in Moscow. His friend Ivan Alexandrov (1912a, b), who was himself a prominent mathematics educator, emphasized the incredible diligence exhibited by Struve in reviewing the textbooks of others (which he had to do as a member of the Scientific Committee of women's educational institutions – the so-called Department of the Empress Maria). But Alexandrov placed even higher value on Struve's civic stance, relating the following episode in support of his opinion of his friend:

> On the issue of student strikes, V. B. adhered to the view that, above all, education in Russia had to be protected and preserved. He believed that, if the strikes continued, we would be left without intelligent workers, and there is no need to explain what that would amount to. This is why, during the last strike, although possessing every opportunity to transfer to a calmer and better paying position, V. B. worked day and night for about three weeks together with his worthy assistants. This was something incredible; they wore themselves

> out completely; there was no practical measure that they did not discuss and did not try to apply. As a result, the Land Surveying Institute was completely unaffected by the strike. (Alexandrov 1912b, p. 135)

It is noteworthy that, although these notes are very similar to the text published by Alexandrov in *Vestnik opytnoy fiziki i elementarnoy matematiki* ["Herald of Experimental Physics and Elementary Mathematics"], neither this passage nor any passages like it appear in the text published in *Vestnik*. It may be supposed that the editors of this journal had a different view of the strike movement.

The same may be supposed with even greater confidence about Alexander Kulisher (1875–1948?). The son of a well-known physician, journalist, and state councillor, Kulisher, graduated from the mathematics faculty of St. Petersburg University and then spent an extended period of time studying foreign systems of education. He was quite active as a promoter of new pedagogical ideas, as the author of articles and reports, as the author of textbooks (Kulisher 1914b), and, perhaps most importantly, as a translator – for example, he prepared a Russian edition of "The Teaching of Mathematics in the Elementary and the Secondary School" by J. W. A. Young (Young 1912). Kulisher enjoyed unquestionable respect as a translator and expert in foreign pedagogy. At the same time, decidedly unfriendly descriptions of him have come down to us, for example, the well-known science educator Raikov (2011) characterized him as an "extremely strange, unpleasantly pushy person, whose work [teaching] fared poorly" (p.419). Teaching, however, did not occupy much of Kulisher's time before the revolution, since as a Jew he was prevented in every possible way from obtaining a position at a government institution or, to say more accurately, was permitted to work only by mistake or temporarily by way of exception (O sluzhbe A. R. Kulishera 1912).

The situation changed after 1917. Kulisher became one of the leading mathematics educators in the country. His translation of Young went through multiple editions. He prepared a new version of his textbook (Kulisher 1922) and published numerous methodological studies, including *Methodology of Teaching Mathematics for Pedagogical Schools* (Leifert 1931), a book that he co-authored. Politically, Kulisher found himself in the left wing of what was called the Leningrad mathematical front (Na leningradskom matematicheskom fronte 1931), which is to say that he supported in every possible way that which the leadership presumably wanted. Consequently, Kulisher's career was quite successful. He became a professor at Leningrad University, head of the geometry department, and director of a scientific research institute formed under the aegis of the mathematics faculty. Although he was in no sense a research mathematician, it took some very intricate intriguing to remove him from the scientific position which he occupied, since he was supported by the local party leadership (Karp 2008). According to the memoirs of the geometrician Vladimir Zalgaller (2002), in September 1937, Kulisher was arrested.[8] He is reported to teach later in exile in Vyatka (Kirov) (http://mathkaf.ucoz.ru/publ/k/kulisher_aleksandr_ruvimovich/11–1–0-47).

[8] The author of this paper has not yet been able to locate his KGB file. Representatives at the St. Petersburg directorate of the FSB (Federal Security Service) have told me that the file is not in their possession.

11 Discussion and Conclusion

"We think that a reform of mathematics education in our secondary schools must take place eventually," exclaimed Posse (1915c, p. 114). Reforms were indeed desired by many, but they were understood in different ways. Posse himself, as we have seen, had a rather narrow understanding of reform, believing that it should mainly entail a certain expansion of the curriculum, but without the removal of older materials. There also existed a much more far-reaching conception of reform, which envisioned a substantial transformation of the system of instruction – after 1917, it was this approach that triumphed, and while its roots did not, of course, lie in ICMI, yet ideas that were to a certain extent consonant with it could also be found in the literature produced by the international reform movement in mathematics. Such ideas had been expressed in Russia (with or without reference to foreign experiences) even prior to the revolution – ideas about visual thinking, the informal study of geometry, the laboratory method, in other words, not just about promoting an appreciation of the significance of functional dependence in schools.

On the other hand, far from everyone agreed that functional dependence was so important. Already in 1936, at a conference of mathematics teachers, the algebraist Vladimir Tartakovsky objected to a teacher who had said: "What does it mean to 'teach' mathematics? It means to teach functional dependence":

> This is a point of view that arose from bourgeois reformism. If we take the secondary school course, then a theorem such as 'all bisectors of a triangle converge in one point' is a difficult and profound mathematical truth, in which functional dependence does not appear in any shape or form. One of the most difficult points is the investigation of mutual positions in space; there is no functionality there, yet this is one of the most mathematical parts. (Stenogramma 1936, pp. 25–26)

Naturally, one might assume that Tartakovsky, and even more so the chair of the meeting, who remarked that propaganda about the significance of functional dependence belongs to an old view of mathematics, realized that "new times call for new music." Still, one might think that both Tartakovsky and certain members of a generation older than his were quite sincere in their doubts and that objections against increasing attention to the functional principle were not always as caricature-like as Mrochek desired to represent them. An active discussion went on. Nor should we forget that there were forces in the country which rejected the necessity of any changes or reforms in principle.

Most noticeable among the participants in the Russian reform movement are probably the numerous professors of mathematics (Sonin, Posse, Koyalovich, Mlodzeyevsky, Sintsov, and others) and educational administrators (Maksheyev, Popruzhenko, Sollertinsky, Struve, Vogt, and others). Gymnasium or real school teachers are not as noticeable, nor were they especially invited to become members of the commission. Nonetheless, even if with a certain lag, new ideas gradually reached the schools (as evidenced by the remark that provoked Tartakovsky's objections and, e.g., by *Materialy po voprosu*... 1913).

A substantial part of the work of the subcommission and its members in fact consisted in the promotion, dissemination, and discussion of new ideas, and its role in the mathematics education of Russia was very significant. It is also true that after the revolution of 1905–1907, Russia was very receptive toward any social reform initiative, and the tendency to form new social associations – congresses, conferences, and meetings – was very great, so the seeds spread by the subcommission fell on fertile soil; but this does not diminish the role played by the subcommission.

On the other hand, that which the subcommission accomplished, unfortunately, was not continued. In any case, a report providing a description of Russian mathematics education before the revolution was prepared. The author of this chapter knows of no studies that analyze these reports or rely on them to describe Russian education. Moreover, there have not been any comparative or generalizing studies in Russia that make use of published reports from different countries either. Such studies must be undertaken.

We have already stressed the importance of studying the biographies of members of the subcommission and, more broadly, of individuals involved in reforms and their sympathizers. Let us repeat that their lives are varied: some died before the revolution; some – such as Maksheyev – emigrated; some ultimately remained respected Soviet scholars and academicians, such as Sintsov or Bernstein; some became Soviet educators, such as Kulisher, and then were arrested or even, like Filippovich, who was quoted above, executed. Studying the lives of these people both individually and as a group offers an opportunity better to understand what took place in mathematics education, and more broadly, in the country.

No less dramatic is the fate of the ideas promoted by the commission: at certain stages, they were categorically rejected (as old and bourgeois); at other times, educators returned to them (e.g., during the period of the so-called Kolmogorov reform during the 1960s–1970s). However, even such returns usually took place without mention of the work of the commission (note, however, that the aforementioned book by Bychkov (1975) came out during the last years of the Kolmogorov reform).

The Russian subcommission's very brief period of activity remains an example of a successful collaboration between Russian mathematics educators and the international movement. Its significance must be recognized, and its investigation continued.

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Publications of the Russian National Subcommission

B.S. and V. Kondratiev. 1911. *Ecole primares et les Ecoles normales and les gymnases du garcons.* St. Petersburg.

Mikhelson, Nikolay, Dmitrii Goriachev [Goriatchev], Pavel Koturnitsky [Kotournitzki], and Alexey Gattsuk [Hartzouck]. 1912. *Les gymnases de jeunes filles et dans l'Institut Superieur Pedagogique des jeunes filles, les gymnases des jeunes files de l'arrondissement de Varsovie, les ecoles industrielles.* St. Petersburg

Mlodzeyevsky [Młodzievsky], Boleslav K. 1915. *Rapport sur l'enseignement mathém. aux Cours Super. des femmes à Moskou.* Pétrograd.

Popruzhenko [Poprugenko] Mikhail, and Zakharii Maksheyev [Makcheyev]. 1911. *Rapport presentés à la déligatión russe.* St. Petersburg.
Possé, Constantine. 1910. Rapport sur läenseignement mathématique dans les Universités, les écoles techniques supéricures et quelques unes des écoles militaires en Russie. St. Pétersburg.
Rapport sur l'enseignement des mathématiques dans les écoles de Finlande: Rédigé par une commission institueé par le Sénat Impérial de Finlande. 1910. Helsingfors.
Vogt, Karl V. 1911. *Bericht uber den mathematischen unterricht an den russischen realschulen.* St. Petersburg.

Other References

I Vserossiiskii s'ezd prepodavateley matematiki [The First Russian National Congress of Teachers of Mathematics]. 1911a. *Pedagogicheskii sbornik* 7: 93–95.
I Vserossiiskii s'ezd prepodavateley matematiki [The First Russian National Congress of Teachers of Mathematics]. 1911b. *Pedagogicheskii sbornik* 10: 392–393.
A.L. 1914 Otchet o Vtorom Vserossiiskom s'ezde prepodavateley matematiki v Moskve [Report on the Second Russian National Congress of Teachers of Mathematics in Moscow]. *Pedagogicheskoe obozrenie* 4: 31–40.
Alexandrov, Ivan. 1912a. Pamyati V.B. Struve [V. B. Struve in memoriam]. *Matematicheskoe obrazovanie* 3: 134–136.
Alexandrov, Ivan. 1912b. Pamyati V.B. Struve [V. B. Struve in memoriam].*Vestnik opytnoi fiziki i elementarnoy matematiki* 556: 97–99.
Beke, Emanuel. 2014. Results obtained in the introduction of differential and integral calculus in upper grades of secondary institutions. *International Journal for the History of Mathematics Education* 9: 35–70.
Belliustin, Vsevolod K. 1912. K reforme prepodavaniya matematiki [Toward the Reform of Mathematics Instruction]. *Pedagogicheskoe obozrenie* 3: 36–39.
Bernstein, Sergey N. 1909. K voprosu ob izmenenii programmy po matematike v sredney shkole [On the Question of Changing Mathematics Curricula in Secondary Schools]. *Pedagogicheskii sbornik*, November: 371–388.
Bilimovich, Anton D. 1907. *Reforma prepodavaniya matematiki v Germanii* [The Reform of the Teaching of Mathematics in Germany]. Kiev: Tipografiya Kievskogo universiteta
Bondarev, Sergey I. 1914. Vtoroy Vserossiiskii s'ezd prepodavateley matematiki [The Second Russian National Congress of Teachers of Mathematics]. *Russkaya shkola* 3: 70–73
Borovik, Vasil' N. 1970. *Pedagogicheskoe nasledie akademika D.M.Sintsova* [The Pedagogical Legacy of the Academician D.M. Sintsov]. Author's Dissertation Summary Submitted in Partial Fulfillment of the Requirements for the Degree of Candidate of the Pedagogical Sciences]. Kiev: Kiev State Pedagogical University.
Bychkov, Boris P. 1975. *Mezhdunarodnoe dvizhenie za reformu prepodavaniya metematiki v sredney shkole* [The International Movement to Reform the Teaching of Mathematisc in Secondary Schools]. Kishinev: Shtinitsa.
Chistyakov, Iosaf I. 1914. 2-y vserossiiskii s'ezd prepodavateley matematiki [The Second Russian National Congress of Teachers of Mathematics]. *Matematicheskoe obrazovanie* 1: 48–50.
Chlen s'ezda [Participant in Congress]. 1914. Matematika v nachsal'noy shkole na vtorom vserossiiskom s'ezde prepodavateley matematiki [Mathematics in Elementary Schools at the Second Russian National Congress of Teachers of Mathematics]. *Pedagogicheskoe obozrenie* 1: 46–52.
Chlen Vtorogo s'ezda [Participant in Second Congress]. 1915. Is vospominanii o 2-m s'ezde prepodavateley matematiki [From Recollections about the Second Congress of Teachers of Mathematics]. *Matematicheskoe obrazovanie* 7-8: 1276–1281.

Commission Internationale de l'Enseignement Mathématique. Liste Complète des Publications du Comité Central et Sous-Commissions nationals. 1920-1921. *L'Enseignement Mathématique* 21: 319–339.

Delo Russkoy natsional'noy podkomissii, vkhodiaschey v sostav Mezhdunarodnoy komissii po prepodavaniiu matematiki [File of the Russian National Subcommission of ICMI]. 1909-1915. Russian State historical archive, f. 734, op. 4, d. 85.

Doklad komissii, izbrannoy Moskovskim matematicheskim kruzhkom dlya rassmotreniya proekta program, vyrabotannogo Komissiey pri Ministerstve narrodnogo prosvescheniya [Report by the Commission Elected by the Moscow Mathematics Circle to Examine the Plan for Curricula Developed by the Commission of the Ministry of Education]. 1916. *Matematicheskoe obrazovanie*, 4: 101–110.

Doklady, chitannye na 2-m Vserossiiskom s'ezde prepodavateley matematiki v Moskve [Reports Delivered at the Second Russian National Congress of Mathematics Teachers in Moscow]. 1915. Moscow.

Gushel', Revekka Z. 2002. K stoletiiu sozdaniya Mezhdunarodnoy komissii po prepodavaniiu matematiki [On the Centennial of the Formation of ICMI]. *Pervoe sentiabria: Matematika* 2.

Gushel', Revekka Z. 2003. O mezhdunarodnom dvizhenn po reformirovaniu matematicheskogo obrazovaniya v nachale XX stoletiya [On the International Movement to Reform Mathematics Education at the Beginning of the Twentieth Century]. *Matematicheskoe prosveschenie* 7: 39–44.

Filippovich, Filipp V. 1912. Pervyi Vserossiiskii s'ezd prepodavateley matematiki [The First Russian National Congress of Teachers of Mathematics]. *Shkola i zhizn'*, 5: 2–3.

Ignatiev, Pavel N. 1933. Education. In *Russia. U.S.S.R. A Complete Handbook*, ed. P. Malevsky-Malevich, 651–676. New York: William Farquhar Payson.

Izvol'skii, Nikolay A. 1916. Po povody novogo proekta program matematiki v sredney shkole [On the New Plan for Mathematics Curricula in Secondary Schools]. *Matematicheskoe obrazovanie* 4: 110–117.

Kagan, Veniamin F. 1911. O reforme prepodavaniya matematiki v srednikh uchebnykh zavedeniyakh Frantsii i Germanii [On the Reform of the Teaching of Mathematics in Secondary Education Institutions in France and Germany]. In *Elementarnaya matematika. Arifmetika I algebra*, authored by Émile Borel, I-XLVI. Odessa: Mathesis.

Karp, Alexander. 2008. "Ne sootvetstvuet sovremennoy postanovke geometrii" (ob odnom epizode iz istorii matematicheskogo obrazovaniya). ["Does Not Correspond to the Modern Understanding of Geometry" (An Episode from the History of Mathematics Education]. In *Problemy teorii i praktiki obucheniya matematike*, ed. by Viktor V. Orlov. St. Petersburg: RGPU.

Karp, Alexander. 2010. Reforms and counter-reforms: Schools between 1917 and the 1950s. In *Russian mathematics education: History and world significance*, ed. by Alexander Karp & Bruce Vogeli, 43–85. London-New Jersey-Singapore: World Scientific.

Karp, Alexander. 2012. Andrey Kiselev: the Life and the Legend. *Educ. Matem. Pesq* 14(3): 398–410.

Karp, Alexander. 2017. On the Russian national subcommission of the ICMI. In "*Dig where you stand" 4*, ed. by Kristín Bjarnadóttir, Fulvia Furinghetti, Marta Menghini, Johan Prytz, Gert Schubring, 149–166. Rome: Edizioni Nuova Cultura.

Karp, Alexander. (Ed.). 2018. *Otchety rossiiskoy natsional'noy podkomissii mezhdunarodnoy komissii po matematicheskomu obrazovaniu* [Reports of the Russian National Subcommmission of the International Commission on Mathematics Instruction]. St. Petersburg: Lema.

K.M. 1900. O predlagaemoy v Anglii reforme v prepodavanii matematiki [On the Reform of the Teaching of Mathematics Proposed in the Great Britain]. St. Petersburg: Tipografiya Morskogo Ministerstva.

Koyalovich, Boris M. n.d. *Otchet Predsedateliu Uchenogo Komiteta Ministerstva Narodnogo Prosvescheniya o komandirovke v Milan* [Report to the Chairman of the Ministry of Education Scientific Committee about the Trip to Milan]. Russian National Library, Manuscript Department, f. 359, # 120.

Kropotov Alexander I. 1967. *Nikolay Yakovlevich Sonin*. Leningrad: Nauka.

K sozyvu tret’ego vserossiiskogo s’ezda prepodavateley matematiki [Toward the Convocation of the Third Russian National Congress of Teachers of Mathematics]. 1915, *Pedagogicheskii sbornik 8*, 138–140.

Kulisher Alexander R. 1914a. Vtoroy Vserossiiskii s’ezd prepodavateley matematiki v Moskve [The Second Russian National Congress of the Teachers of Mathematics in Moscow]. *Shkola i zhizn’* 6: 9–11.

Kulisher Alexander R. 1914b. *Uchebnik geometrii*. [Geometry Textbook]. Part 1. St. Petersburg: P.V.Lukovnikov.

Kulisher Alexander R. 1915. Matematika na vseshveitsarskoy vystavke 1914 goda v Berne [Mathematics at the Swiss National Exhibition of 1914 in Berne]. *Shkola i zhizn’* 17: 2–5.

Kulisher Alexander R. 1922. *Uchebnik geometrii. Kurs edinoy trudovoy shkoly*. [Geometry Textbook. Unified Labor School Course]. Berlin: Gosudarstvennoe izdatel’stvo RSFSR.

Lankov, Alexander V. 1949. K istorii voprosa o reforme prepodavaniya matematiki [On the History of the Question of Mathematics Education Reform]. *Matematika v shkole* 6: 1–4.

Leifert, Leonid A. (Ed.). 1931. *Metodika matematiki dlya pedagogicheskikh tekhnikumov* [The methodology of teaching mathematics. Textbook for Pedagogical schools]. Moscow-Leningrad: OGIZ.

Markushevich, Alexey I. 1950. O povyshenii ideino-teoreticheskogo urovnya prepodavavniya matematiki v sredney shkole [On Raising the Conceptual-Theoretical Level of the Teaching of Mathematics in Secondary Schools]. *Matematika v shkole* 1: 1–4.

Materialy po voprosu ob uluchshenii postanovki prepodavaniya matematiki v srednikh uchebnykh zavedeniyakh Kavkazskogo uchebnogo okruga [Mateirals Pertaining to the Issue of Improving the Organization of the Teaching of Mathematics in the Secondary Educational Institutions of the Caucasus School District]. 1913. Tiflis: Upravlenie Kavkazskogo uchebnogo okruga.

Materialy po reforme sredney shkoly [Materials Pertaining to Secondary School Reforms]. 1915. *Zhurnal Ministerstva narodnogo prosvescheniya* December: 245–283.

Metel'skii, Nikolay V. 1967. *Progressivnoe nasledie dvizheniya za reformu prepodavaniya matematiki* [The Progressive Legacy of the Mathematics Educcation Reform Movement]. Author’s Dissertation Summary Submitted in Partial Fulfillment of the Requirements for the Degree of Candidate of the Pedagogical Sciences. Minsk: MGPU.

Metel'skii, Nikolay V. 1968. *Ocherki istorii metodiki matematiki* [Sketches of the History of Mathematics Methodology]. Minsk: Vysheyshaya shkola.

Mordukhay-Boltovskii, Dmitry.1912. *O pervom vserossiiskom s’ezde prepodavateley matematiki* [On the First Russian National Congress of Teachers of Mathematics]. Warsaw: Tipografiya Uchebnogo okruga

Mordukhay-Boltovskii, Dmitry. 1914. *Vtoroy vserossiiskii s’ezd prepodavateley matematiki* [The Second Russian National Congress of Teachers of Mathematics]. Warsaw: Tipografiya Uchebnogo okruga.

Mrochek Vatslav R. 1912. *Itogi pervogo vserossiiskogo s’ezda prepodavateley matematiki* [Outcomes of the First Russian National Congress of Mathematics Teachers]. St. Petersburg.

Mrochek, Vatslav R., and Filipp V. Filippovich. 1910. *Reforma prepodavaniya matematiki* [The Reform of Mathmematics Education]. St. Petersburg: Tipografiya Montvida.

Na leningradskom matematicheskom fronte [On the Leningrad Mathematics Front]. 1931. Moscow-Leningrad: Gosudarstvennoe sotsial’no-ekonomicheskoe izdatel’stvo.

Nazarenko, T. 1926. Opyt uvyazki matematiki v komplekse [Experience with Connecting Mathematics to a Complex]. *Radyanska shkola 6*, 61–65.

Ob uchastii Rossii v Mezhdunarodnoy komissii po prepodavaniu matematiki [On Russia's Participation in ICMI]. 1909–1916. Russian State historical archive, f. 733, op. 145, d. 288.

O sluzhbe A.R.Kulishera [On A. R. Kulisher’s Service]. 1912. Russian State historical archive, f. 25, op. 1, d. 2505.

Pavlovskii, Ivan .F. 1890. *Istoricheskii ocherk Petrovskogo Poltavskogo kadetskogo korpusa.* [A Historical Sketch of the Petrovsky Poltava Cadet Corps]. Poltava: Tipografiya gubernskogo pravleniya.

Polyakov, Alexey P. 1914. Mezhdunarodnaya konferentsiya po prepodavaniiu matematiki, sostoyavshayasya v Parizhe s 1 po 4 aprelya (novogo stilya) 1914 goda [The International Conference on Mathematics Instruction, which Took Place in Paris from April 1 to April 4 (New Style), 1904]. *Matematicheskoe obozrenie* 6: 256–268.

Popruzhenko, Mikhail G. 1904. Oskudenie [Impoverishment]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 361: 3–7.

Popruzhenko, Mikhail G. 1912. Pervyi vserossiiskii s’ezd prepodavateley matematiki [The First Russian National Congress of Teachers of Mathematics]. *Pedagogicheskii sbornik* 2: 268–278.

Popruzhenko, Mikhail G. 1914a. Vtoroy vserossiiskii s’ezd prepodavateley matematiki [The Second Russian National Congress of Teachers of Mathematics]. *Pedagogicheskii sbornik* 7: 41–50

Popruzhenko, Mikhail G. 1914b. Vtoroy vserossiiskii s’ezd prepodavateley matematiki [The Second Russian National Congress of Teachers of Mathematics]. *Pedagogicheskii sbornik* 10: 266–276

Popruzhenko, Mikhail G. 1922. *Nachala analiza* [Elementary Analysis]. Moscow: Gosizdat.

Popruzhenko, Mikhail G. 1939. *Sbornik geometricheskikh zadach* [Collection of Problems in Geometry]. Leningrad: Uchpedgiz.

Posse, Konstantin A. 1914. Mezhdunarodnaya komissiya po prepodavaniyu matematiki. Konferentsiya v Parizhe 1–4 aprelya 1914 g. [International Commission on Mathematics Instruction. Conference in Paris, April 1–4, 1915]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 607: 198–205.

Posse, Konstantin A. 1915a. Otzyv zasluzhennogo professora K.A.Posse o predlozheniyakh, izlozhennykh v rezoliutsiyakh, prinyatykh vtorym Vserossiiskim s’ezdom preposavateley matematiki [Response by Distinguished Professor K. A. Posse to Proposals Formulated in the Resolutions Passed by the Second Russian National Congress of Teachers of Mathematics]. *Zhurnal Ministerstva narodnogo prosvescheniya* 3: 21–34.

Posse, Konstantin A. 1915b. N.Ya. Sonin. Nekrolog [N. A. Sonin. Obituary]. *Zhurnal Ministerstva narodnogo prosvescheniya* 6: 105–124.

Posse, Konstantin A. 1915c. [Review]. *Zhurnal Ministerstva narodnogo prosvescheniya* 1: 110–114.

Raikov, Boris. 2011. *Na zhiznennom puti* [On Life's Way]. Volume 1. St. Petersburg: Kolo.

Rezoliutsii 2-go vserossiiskogo s’ezda prepodavateley matematiki [The Resolutions of the Second Russian National Congress of Teachers of Mathematics]. 1914. *Matematicheskoe obrazovanie* 1: 50–52.

Shcherbina, Konstantin M. 1908. Matematika v russkoy sredney shkole [Mathematics in Russian Secondary Schools]. Kiev:Tipografiya Imperatorskogo universiteta sv. Vladimira.

Shokhor-Trotsky, Semen I.1911. K reforme prepodavaniya matematiki [Towards the reform of mathematics education]. *Russkaya shkola* 3: 117–142.

Shokhor-Trotsky, Semen I.1912. K reforme prepodavaniya matematiki [Towards the reform of mathematics education]. *Russkaya shkola* 2: 119–143

Sheremetevskii Vsevolod P. 1895. Matematika, kak nauka, i ee shkol'nye surrogaty [Mathematics as a Science and Its School Surrogates]. *Russkaya mysl'* V: 106–125.

Sintsov, Dmitry M. 1908. Chetvertyi mezhdunarodnyi matematicheskii kongress v Rime 6-11 aprelia [The Fourth International Mathematical Congress in Rome, April 6-11]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 460: 73–81.

Sintsov Dmitry M. 1910a. Mezhdunarodnaya komissiya po prepodavaniu matematiki. Matematika na vystavke v Briussele [International Commission on Mathematics Instruction. Mathematics at the Exhibition in Brussels]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 524: 193–199.

Sintsov Dmitry M. 1910b. Mezhdunarodnaya komissiya po prepodavaniu matematiki. Matematika na vystavke v Briussele [International Commission on Mathematics Instruction. Mathematics at the Exhibition in Brussels]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 525: 227–234.

Sintsov, Dmitry M. 1911a. Mezhdunarodnaya komissiya po prepodavaniu matematiki. Siezd v Milane 5-7 (18-20) sentiabria 1911 g. [ICMI. Congress in Milan, September 5-7 (18-20), 1911]. *Vestnik opytnoi fiziki i elementarnoy matematiki* 550: 267–282.

Sintsov, Dmitry M. 1911b. *Pis'mo professora matematiki Khar'kovskogo universiteta Predsedateliu Uchenogo Komiteta N.Ya. Soninu o rabote milanskogo s'ezda matematikov* [Letter from a University of Kharkov mathematics professor to the chair of the Scientific Committee N.Ya. Sonin about the Work of the Congress of Mathematicians in Milan]. Russian State historical archive, f. 734, op. 5, d. 261.

Sintsov, Dmitry M. (Ed.). 1911c. *Sbornik program I instruktsii po prepodavaniiu matematiki v Zapadnoy Evrope* [Collection of Curricula and Instructions on Teaching Mathematics in Western Europe]. Moscow: Tipografiya Sytina.

Sintsov, Dmitry M. 1912a. V Mezhdunarodnyi matematicheskii s'ezd v Cambridge [The International Mathematical Congress in Cambridge]. *Vestnik opytnoi fiziki i elementarnoy matematiki 569*, 129–136.

Sintsov (Sintsof), Dmitry M. 1912b. Le premier congrès des professeurs de Mathématiques en Russie. *L'Enseignement Mathématique* 14: 222–228.

Sintsov, Dmitry M. 1913. Mezhdunarodnaya komissiya po prepodavaniyu matematiki [International commission on mathematics instruction]. In *Trudy 1-go vserossiiskogo s'ezda uchiteley matematiki, volume 3*, 1–19). St. Petersburg: Sever.

Sintsov (Sintsof) Dmitry M. 1929. Russia. In *Significant changes and trends in the teaching of mathematics throughout the world since 1910*, edited by W.D.Reeve, 94–11. New York: Teachers College, Columbia University.

Sonin, Nikolay Ya., Boris M. Koyalovich, Karl, V Vogt. 1909. Mezhdunarodnaya komissiya po prepodavaniiu matematiki. Predvaritel]nyi doklad. [Preliminary Report. International Commission on Mathematical Instruction]. *Zhurnal Ministerstva narodnogo prosvescheniya 3*, 34–47.

Soveschanie o reforme sredney shkoly [Conference on Secondary School Reforms]. 1915. *Pedagogicheskii sbornik* 7: 49–58.

Soveschaniya, proiskhodivshie v 1899 godu v Moskovskom uchebnom okruge po voprosam o sredney shkole. Vypusk 6. [Conferences Which Took Place in 1899 in the Moscow School District to Address Questions Pertaining to Secondary Schools]. 1899. Moscow.

S.P. 1902. *O programmakh matematiki* [On Mathematics Curricula], *Pedagogicheskii sbornik* 2: 142–153.

Stanislavskii, Konstantin S. 1929. *Moya zhizn' v iskusstve* [My Life in Art]. Leningrad: Academia.

Stenogramma soveschaniya uchiteley matematiki nachal'nykh shkol [Transcript of Elementary School Teachers' Conference]. 1936. Central state archive of Saint Petersburg, f. 5039, op. 3, d. 140.

Trudy vysochaishe utverzhdennoy komissii po voprosu ob uluchsheniyakh v sredney shkole [Proceedings of the Imperially Constituted Commission on the Question of Improvements in Secondary Schools]. 1900. St. Petersburg: Tipografiya S-Peterburgskoy tiur'my.

Trudy komissii P.S. Vannovskogo po preobrazovaniiu sredney shkoly [Proceedings of the P. S. Vannovsky Commission on the Transformation of Secondary Schools]. 1901.St. Petersburg.

Trudy 1-go vserossiiskogo s'ezda uchiteley matematiki [Proceedings of the First Russian National Congress of Teachers of Mathematics]. Volumes 1-3. 1913. St. Petersburg: Sever.

Tsvetkov, Ivan. 1911. O pedagogike matematiki. *Russkaya mysl'* 2: 14–22.

Volkov, Alexander A. 1916. Proekt novykh program prepodavaniya matematiki v sredney shkole, sostavlennyi Komissiey pri Ministerstve narodnogo prosvescheniya vesnoy 1915 goda [Plan of New Programs for Teaching Mathematics in Secondary Schools, Written by the Commission of the Ministry of Education in Spring 1915]. *Matematicheskoe obrazovanie* 1-2: 24–40

Vol'berg, Ovsey A. 1918. Matematika v trudovoy shkole [Mathematics in the school of labor]. *Matematika v shkole* 1(1–2): 9–18.

Vol'berg, Ovsey A. 1919. Dva mirovozzreniya [Two Worldviews]. *Narodnoe prosveschenie* 11-12: 81–86.

Ushakov N. 1914. Otchet o 2-m vserossiiskom s'ezde prepodavateley matematiki [Report on the Second Russian National Congress of Teachers of Mathematics]. *Vestnik obrazovaniya i vospitaniya* 4: 442–452

Young, Jacob W.A. 1912. *Kak prepodavat' matematiku. Prepodavanie matematiki v sredney i nachal'noy shkole*. *V 2-kh vypuskakh*. [How to Teach Mathematics. The Teaching of Mathematics in Secondary and Elementary Schools. In Two Installments]. St. Petersburg: Obschestvennaya pol'za.

Zalgaller, Vladimir A. 2002. Vospominaniya ob A.D.Alexandrove i ego Leningradskom geometricheskom sdeminare (1945–1963) [Recollecting A.D]. In *Akademik Alexander Danilovich Alexandrov. Vospominaniya. Publikatsii. Materialy*, ed. by G.M. Idlis and O.A. Ladyzhenskaya 15–33. Moscow: Nauka.

Zasedanie 29 aprelya 1909 goda [Meeting of April 29, 1909]. 1910. *Soobscheniya Khar'kovskogo matematicheskogo obschestva* XI (6): 298–299.

Zavadskii, Norbert B. 1904. *K voprosu o reforme prepodavaniya matematiki* [On the Issue of Mathematics Education Reform]. St. Petersburg.

Chapter 7
The American National Subcommission of ICMI

Alexander Karp

Abstract This chapter attempts to describe the work of the American National Subcommission, from its formation until the dissolution of ICMI. David Eugene Smith, who proposed the formation of ICMI, was the chairman and leading figure of its American Subcommission; his archives contain numerous documents that make possible a relatively complete reconstruction of what took place during those years, shedding light on the selection of the commission's collaborators, the financial aspects of its work, and the preparation of its publications. Analysis of the subcommission's work enables a better understanding of the state of mathematics education in the country at this important stage in its development.

Keywords American National Subcommission · Reform · Reports · Committees · Subcommittees · Bulletin of the Bureau of Education · Commissioner of Education

1 Introduction

The work of the American Subcommission of ICMI is connected first and foremost with the name of David Eugene Smith, who was its chairman. Smith's special role in ICMI inevitably influenced the work of the subcommission, which sometimes set goals for itself that were far more general than those which national subcommissions were, broadly speaking, expected to set for themselves. Another distinctive feature that cannot be overlooked in discussing the subcommission consists in the fact that Smith's archive (including his so-called professional papers, including his correspondence) has been well preserved (although, of course, not everything has survived, and the content of certain letters can be only surmised). Therefore, many of the steps taken by the subcommission can be described in detail, based on these documents. This is what is undertaken in the present study. Another distinctive characteristic of the work of the American Subcommission stems from the fact that the

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United States, which entered the First World War only in 1917, remained in a certain sense in more favorable circumstances for completing its work than the main European countries, which entered the war far earlier.

The war, however, inevitably led to a lessening of attention to that which had been done, which has to a certain degree persisted to the present day. It should be noted that studies that address the work of the American Subcommission are few in number. Mention must be made of a dissertation by Donoghue (1987) and a chapter by Donoghue (2003), which like the present study largely rely on Smith's professional papers and contain descriptions of important stages in the history of the subcommission. Various aspects of the subcommission's work are mentioned or discussed in publications by Jones and Coxford (1970), Stanic (1987), Roberts (1997), and others. At the same time, it is characteristic that, for example, in the dissertation by Yasin (1961), under the heading "The reform movement in secondary mathematics – its history and present state," only a few pages were devoted to ICMI, and even these largely focused specifically on its international activity and not on what was accomplished by the American Subcommission (which is mentioned only very briefly). Many details and aspects of the American Subcommission's work still remain undiscussed.

2 American Mathematics Education Before 1908

The last quarter of the nineteenth century and the beginning of the twentieth century were a period of rapid change in education in the United States and perhaps mathematics education in particular. Parshall (2003) notes that it was precisely at this time that a mathematical community began to take shape in this country. Donoghue (2003) speaks of the formation of a community of mathematics educators at this time and lists the numerous associations, journals, and teacher preparation programs that appeared during these years.

Naturally, some system of education, including mathematics education, existed prior to this time as well (Jones and Coxford 1970), but during these years significant changes occurred. According to census data, the population of the United States in 1880 was slightly over 49 million; by 1910, it had grown to over 92 million. Between 1890 and 1900, the number of public high school students (Donoghue 2003, p. 159) more than doubled. Nor should we forget about the development of science and technology, which made communication and travel between different regions far easier. This by no means implies that regional differences disappeared or went unrecognized: as we will see, that was not at all the case, and much was thought and said about the differences between those who came from the East and those who represented "the men of the North Central states"; but nonetheless, it became easier to travel to another state, even a distant one, while to send a telegram or even a letter was altogether simple – reading the correspondence of that time, one is astonished how well the postal system worked and how easily and abundantly people corresponded (even though this was not very cheap).

The period that we will be discussing was a time when a concerted effort was made to introduce order and standardization. In 1892, the Commission of Ten (1894) was established, whose recommendations laid the foundations for curricula and teaching practices in the country. Other commissions and associations appeared and operated as well, both in education in general and in mathematics and mathematics education in particular. The American Mathematical Society was founded in 1888 (at first, as the New York Mathematical Society). Various types of associations of mathematics teachers appeared in many states. A report concerning the establishment of the American Federation of Teachers of the Mathematical and the Natural Sciences in the journal *School Science and Mathematics* – founded in 1901– relates that 27 delegates were present at the meeting, representing seven associations as follows: the Association of Mathematics Teachers of the Middle States and Maryland, the New York State Science Teachers' Association (Mathematics Section), the Central Association of Science and Mathematics Teachers, the Association of Teachers of Mathematics in New England, the Association of the Teachers of Physics of Washington City, the Missouri Society of Teachers of Mathematics and Science, and the New Jersey State Science Teachers' Association (The American Federation of Teachers of the Mathematical and the Natural Sciences 1907, p. 242). And this by no means exhausts the list of American associations connected with the teaching of mathematics. It may be said that when Smith proposed to establish the International Commission, he was acting in the spirit of what was going on in his country – the establishment of commissions or associations was a natural movement.

Several characteristic features of what took place should be noted. First, both the development of mathematics and the development of mathematics education took place in close connection with what was taking place in Europe. Parshall (2003) rightly notes the role of J.J. Sylvester, an Englishman working at Johns Hopkins University, in the formation of American mathematics, as well as the importance of trips to Europe, above all to visit Felix Klein, whose pupils and pedagogical principles turned out to be very important in the United States (let us here name one of his pupils: William Fogg Osgood (1864–1943), who would become a major mathematician, a Harvard professor, and a president of the American Mathematical Society; as will be discussed below, Osgood played an important role in the work of the American Subcommission). Mathematics educators also felt that they were part of a common movement with Europe – or at least an interconnected one. To see this, it is sufficient to look inside the first books for the preparation of teachers, *The teaching of elementary mathematics* by David Eugene Smith (1900) or *The Teaching of mathematics in the elementary and secondary school* by Jacob William Albert Young[1] (1907): references to the European experience and to European literature, as well as trips to Europe for prominent figures in mathematics education, were obligatory.

[1] We will return to J. W. A. Young (1865–1948) below – he went on to play an important role in the American Subcommission. He began his career as a mathematician by defending a Ph.D. in algebra and shortly thereafter becoming an assistant professor at Chicago University, founded in 1890. Subsequently, he focused on mathematics education, becoming one of the most influential figures in it.

At the same time – and this is another characteristic of the American mathematics education of that time, which must be mentioned – considerable attention was devoted to reforms. The names and ideas of John Perry and Felix Klein were well known. The prominent mathematician Eliakim Hastings Moore devoted a large part of his presidential address to the American Mathematical Society in 1902 to the problems of mathematics education (Donoghue 2003; Roberts 1997), proposing his own program of reforms, which was clearly informed by the ideas of Perry. He spoke out in favor of the laboratory method, the unification of different mathematical subjects into a single course, reducing the emphasis on the formal-axiomatic side of mathematics in order to give way to inductive reasoning, and so on. This program, however, by no means found favor with everyone. And here yet another characteristic must be mentioned, even if it was typical by no means only of the United States: the existence of a broad spectrum of opinions about how school mathematics should be taught and reformed.

Stanic (1986, 1987) follows Kliebard (1981) in identifying four interest groups operating at that time (and later as well): the humanists, the developmentalists, the social efficiency educators, and the social meliorists. While the first adhered to more or less traditional views, defending the value of mathematics as a subject that developed the individual, taught within the framework of an established cultural tradition, the developmentalists based their arguments on the importance of taking the individual development of each child into account, which by no means necessarily coincided with the traditions that had become established in the schools. The social efficiency educators strove to construct an effective system, which would effectively prepare students for their future life (which in its turn was usually envisioned without any uncertainty and without any expectation of unpredictability). Finally, the social meliorists were passionate about fairness and fixing the world, and therefore they concerned themselves above all with the equality of opportunities that education offered.

Naturally, these groups should not be simplistically understood in too rigid a fashion: neither humanists, nor social meliorists, nor any of the others were organizations with rigid mandates, and the same author could defend positions in which views characteristic of different groups appeared side by side. Nonetheless, these different views did exist, and probably it would be fair to say that certain views were more widespread in the United States than in other countries, as would become apparent during the next period, the age of progressive education.

It was under these conditions that the American Subcommission of ICMI, which came into being on the initiative of D. E. Smith, began its work.

3 The Formation of the American Delegation

As one of the organizers of the International Commission, Smith naturally became one of the members of the American Subcommission (or delegation, as it was also called). By the summer of 1908, he began a correspondence with the aim of putting together a delegation, that is, of finding two other members. It should be noted that there was no firmly established procedure for doing so. Smith wanted this American delegation to consist of Harvard mathematics professor William Fogg Osgood and University of Chicago professor Jacob William Albert Young. He himself explained it as follows in a letter to Young from November 7, 1908:

> It now looks very much as if the American delegates would consist of Osgood, yourself and myself. I must confess to have urged this selection in preference to all others, because I believe we represent three fairly different positions geographically and with respect to certain matters of teaching. I believe that we could work together in rather more harmony than most such commissions can. It is now the intention of the organization commission that we should be the American delegates.

However, the quoted letter from November was written already toward the end of the formation of the delegation, and it appears that Osgood was the first to be invited, since Young was in Europe at the time. Osgood did not agree immediately, and he asked Smith on July 29, 1908, to explain "what the nature of the work will be." In response to which, Smith proposed to meet and sent Osgood a preliminary report "which Klein has prepared for distribution at this time" (Smith to Osgood, September 21, 1908). Three weeks later (on October 14), in a new letter he writes:

> I enclose a letter just received from Professor Klein. Untangling his chirography as much as possible I judge that Greenhill will get the Education Department of England to send a request to the various governments for the appointments. In that case such a request will probably reach our Board of Education. I am therefore rather inclined to write to Commissioner Brown and state the situation as it has thus far developed. Unless this strikes you as poor policy I will proceed accordingly.

Osgood approved of the idea of writing to Commissioner Brown, but the matter could not be resolved so simply. Harry Walter Tyler (1863–1938), professor at MIT, proposed in a letter to Osgood to make an announcement about the formation of the delegation at the approaching meeting of the American Federation of Teachers of the Mathematical and the Natural Sciences. Osgood and Smith were unanimous in their reply:

> Your understanding of the case is exactly mine, namely, that the commission of three is the only official commission and is to be responsible for the American report. This commission may form such an advisory commission as it may wish to assist it (Smith to Osgood, November 17, 1908)

Furthermore, Smith proposed to respond to Tyler as follows:

> I have said that I felt that it was premature to attempt any official action on the part of the federation of [probably should be: "or"] any other organization until we could know the exact wishes of Klein and his associates.

In a letter to Osgood on November 19, Smith develops his idea, noting that he himself will not be present at the Federation's meeting:

> It does not seem to me at all wise to do anything more than we are doing, namely to announce that such a commission will in due time to be appointed and to arouse an interest in the movement. I therefore hope that he will not bring the matter before the Federation save in this spirit. It is quite probable, however, that we shall hear from Klein in the course of a week or so.

Nonetheless, Klein could not make decisions and appointments for the United States. Smith was quite aware of this "delicate" detail, as he put it. His letter from October 16, 1908, to US Commissioner of Education Elmer Ellsworth Brown (1861–1934), which he had discussed with Osgood, as was noted above, deserves to be quoted almost in full:

At the fourth International Congress of Mathematicians held at Rome last April I read a paper on the Teaching of Mathematics in the United States, a copy of which I am sending under separate cover. In this I advocated the formation of an International Commission on the teaching of mathematics, the object being to bring the various leading countries of the world in touch with one another on the question of reform in teaching this subject. The suggestion was received with much enthusiasm and after a couple of days of discussion I moved the appointment of a commission of three to organize the international commission. This commission consisted of Professor Klein, the eminent mathematician of Gottingen, Sir George Greenhill of London, and Professor Fehr of Geneva. Sir George Greenhill was named partly because the next congress is to be held in England, and Professor Fehr was named because he is editor of L'Enseignement Mathematique.

I have met with this preliminary commission several times and we have gone over very carefully the method of constituting this international commission. It has now been decided that an attempt will be made to have the English government officially ask the various countries to name members of this commission. Whether this can be accomplished or not I do not know, if, however, it is brought about and England asks our country to name three members, it is practically certain that the matter will be referred to you.

The matter becomes a little delicate at this point because in making any suggestion as to the personnel of the commission it must appear as if I wished a place. The preliminary commission, however, has gone over this matter with much care and had, before the final decision to ask England to take official action was decided upon, entered into some correspondence with possible members. In this country the preliminary commission had hoped that Professor Osgood of Harvard might be named on account of his great eminence as a mathematician, his conservative judgment, and his unusual interest in the teaching of the subject. It was hoped that I might be named as a member because of my contributions to the pedagogy of the subject, my experience in training teachers and my contact with the various grades of schools. It was further hoped that Professor J. W.A. Young of Chicago might be the third member because of his contributions to mathematical teaching, his position in the Middle West, and his advanced views in the matter of reform. The matter was some time ago suggested to Professor Osgood and myself and I presume it has been to Professor Young, inasmuch as he is now abroad.

At the suggestion of the chairman of the preliminary commission I call your attention to the status of the matter at present. I know that Professor Osgood, like myself, would be glad to be relieved from the work of such a commission. On the other hand, he feels as I do, if named upon the commission it would be his duty to accept.

As I have said above, it is a little embarrassing to make this frank statement of the present status. If the preliminary commission had made the appointments themselves, as they had planned, the three persons that I have mentioned would have been named. Professor Klein suggests that I nominate them to you and that suggestion I am carrying out today. In case you are asked to make the nominations and care to consult me further concerning the matter, I shall be very glad to go to Washington for that purpose.

Brown graciously replied to Smith on October 29, 1908:

Your statement puts me in possession of just such information as I need in order to act intelligently in this matter when it may be referred to me. By far as I can now see. I shall be glad to carry out the plan which you and your colleagues have suggested. It was quite right that you should mention it to me, and I do not know of anything equally good that I could have devised without your help.

Smith replied no less graciously, letting it be known that an official letter from England might well not arrive and possibly (since we do not possess such a letter) trying to spur Brown to take action even in the absence of such a letter. In any case, in a letter from January 6, 1909, Brown writes to Smith as follows:

> I had to acknowledge the receipt of your letter of the twenty-fourth ultimo, and to thank you for advising me of the selection, by the organizing commission of the International Commission on the Teaching of Mathematics, of three delegates to represent the United States in the deliberation of that body. This selection accords with the information conveyed in your letter of October 16, 1908, and certainly meets with my hearty approbation. I shall hold myself in readiness to consider, and so far as it may be in my power to assist in, any plans the commission may desire to consult me about.

This letter may rightly be considered the official American finalization of the delegation's membership – at least, we know of no other, nor was the question of finalization ever brought up again (here it should be noted that, as Smith writes to Osgood and Young in a letter from February 6, Sir George Greenhill informed him that it was not possible to obtain government support in England, and hence there was no general English appeal to other governments). The delegates turned to further work, immediately agreeing (in a letter from Smith to Osgood from January 20, 1909) that all of their correspondence would be confidential, while the official records would contain only those definite actions which they had fully agreed upon (the first to write about this was Young).

At this point, however, the question of the Commission's chairmanship arose: specifically, it arose when, on February 6, 1909, Smith proposed to order a letterhead that would list the names of the Commission's members in alphabetical order – Osgood, Smith, and Young. Osgood, in a letter from February 9, objected that it would be more proper to list the names in the order: Smith, Young, and Osgood, with Smith as the chairman. In a letter to Osgood from February 10, Smith objects:

> I feel very strongly opposed to your suggestion. Professor Young has felt that inasmuch as this relates to the teaching of mathematics rather than to questions of pure mathematics it would be more appropriate to have someone as chairman who had written upon the educational side. He was quite insistent that I should be chairman and I was equally insistent that you should have that place. I should not write to you upon this matter at present only I feel that you may be taking it up to Young. I urge you not to take hastily to this matter. I feel that the dignity of the work will be much more emphasized if a pure mathematician of your prominence shall be chairman.

In their subsequent correspondence, Osgood thanked Smith and declined, writing that he was too busy. Smith tried to persuade him, promising all manner of assistance. Osgood once again declined, explaining that Young and Smith were the ones mainly doing the work. Smith wrote to Young as well, explaining how important it was for the head of the Commission to be a mathematician. Young supported Smith's candidacy. In the end, Smith became the chairman, and it became mainly his responsibility to carry out an enormous quantity of work, which will be discussed below. Looking ahead, we can say that the three commissioners indeed worked, as Smith had predicted, with "rather more harmony than most such commissions can." At the beginning of their work, one can still detect certain slight frictions, if only in the quantity of considerations and proposals made by Young or when Smith wrote to Osgood (May 6, 1909), proposing that Young should be the chairman during Smith's absence in summer: "I may say personally that I think also it would be a good plan to let Young realize the difficulties of the position." But subsequently these frictions disappear – both Osgood and Young usually leave final decisions to Smith, recognizing and noting his energy and aptitude for conducting affairs. The correspondence among the commissioners was quite intensive – usually several letters were sent each week.

It should also be noted that the first printed letterhead, possibly ordered at the same time as the discussion began, listed the names of the members of the delegation in alphabetical order, but subsequently the names were listed as follows: Smith, Osgood, and Young.

4 The Formation of Committees and the Beginning of Work on Reports

Once the Commission was formed, its work proceeded in three interconnected directions. It was necessary to resolve financial problems: there was no longer any hope that it would be possible to resolve them once and for all through the intervention of the British government. It was necessary to carry out the task for which the Commission had been formed: to prepare reports. And finally, both in order to secure funding and to interest people in participating in the work, the country and above all the professional community had to be informed about the work that was being carried out. We will discuss all three of these aspects, beginning with the most crucial one – the preparation of reports.

In early 1909, the commissioners intensively discussed the plan of the work – not all information about these discussions has survived, especially because certain matters were clearly also discussed orally. It is evident that Smith proposed forming several committees devoted to various sides and aspects of mathematics education in the United States, which in their turn would be subdivided into subcommittees whose aim would be to focus on specific aspects of the problem being discussed and to prepare their own reports. (The deadline for the submission of the first drafts of the reports was set initially for December 1, 1909, and later revised to February 1, 1910.) This proposal was accepted on the whole, although with certain changes. For example, Osgood in a letter from February 6, 1909, noted: "I suppose that we can hardly enter on the question of discussing course of study for abnormal pupils." In the same letter, he proposed forming a separate committee devoted to education in military academies, while at the same time proposing not to form such commissions for religious schools. Smith (in a letter to Osgood from February 8, 1909) agreed that he had initially wanted to subdivide everything too minutely. Subsequently, the commissioners returned more than once to the issue of uniting several commissions into one or conversely breaking down one commission into several, if for no other reason than only because finding people willing to undertake the proposed work was not so simple.

Many letters are filled with discussions of possible candidates. It should be said at once that the mathematics and mathematics education communities on the whole actively took part in the project. As Tyler wrote to Osgood already on December 21, 1908, in the course of the aforementioned discussion concerning the role of the Federation of Teachers of the Mathematical and the Natural Sciences:

> I am sure I need not tell you that if the Federation – so far as I can speak for it – or if I personally, can be of any service in connection with the work of the International Commission we shall be only too glad to do so.

To be sure, not everyone could always serve on a commission due to the required time commitment, and even more importantly, the commissioners did not wish to invite everyone. Their position had two sides, which were not always easy to combine. On the one hand, they wished to remain in a role of leadership and therefore endeavored to appoint all subcommission heads themselves; and even if they did invite committee heads to nominate them (although they often nominated them themselves also), they retained the right to approve and to some extent edit reports and the like. But on the other hand, they undoubtedly wished to invite people who represented different sides of the system of mathematics education that had taken shape in the country, among whom were people whose positions, as Stanic (1987) rightly notes, were significantly different from the position of the commissioners.

Below, we will yet have occasion to discuss the reports themselves and their subject matter; at this point, we will address only procedural matters, which involved an enormous amount of correspondence. Here, for example, is how the commissioners began to organize Committee No. V on Normal Schools (which was subsequently excluded from the list of separate committees, after being combined with other groups). On April 29, 1909, Smith sent the following letter to Edson Homer Taylor (from the Eastern Illinois State Normal School):

> There is sent to you by this mail a copy of the Preliminary Report of the International Commission on the Teaching of Mathematics and a copy of the Preliminary Report of the American Commissioners. Upon examining the latter you will see that it is proposed to appoint several important commissions to carry on this investigation, and it is the earnest desire of the Commissioners that you should act as chairman of Committee No. V on Normal Schools.
>
> The duties of this chairmanship will include (1) Assisting the Commissioners in the selection of the various chairmen and members of the subcommissions, and upon receipt of your acceptance a list of names that have been considered will be sent to you for suggestions of changes and additions; (2) Organizing and supervising the work of the various subcommissions; (3) Directing the preparation of the report of the commission and transmitting the same with the full reports of the subcommissions; (4) Acting in the general capacity of chairman in case it is possible to arrange for commission meetings. The Commissioners have at present no funds available for the expenses of this work. They are personally paying their own expenses, which are quite considerable, but they trust that, as the work develops, its great importance will be so manifest that the needful funds will be secured. If a sufficient amount can be secured, it is proposed to defray the expenses of correspondence of the commissions, but it is hoped that motives of patriotism and of

> devotion to the work will lead the commissions to bear this expense themselves for the time being at least.
>
> I sincerely hope that I may receive your early acceptance of this important chairmanship, and I assure you that you will have the earnest cooperation of all of the American Commissioners in prosecuting your work.

Taylor accepted the invitation, after which, on May 5, Smith wrote to Taylor:

> I hand you herewith a list of names that suggest themselves to us as available for your commission, we should be pleased to have you send at your earliest convenience any suggestions of replacements that you think would strengthen this commission, the final selection must obviously remain in the hands of the Commissioners in order to avoid duplication and to secure suitably distributed representation of various types of schools and educational interests. You are therefore invited to send in a few alternative names. It is hoped that we may secure a body of earnest workers of sound judgment who are interested in the true progress of mathematical teaching. Other things being equal it would be preferable to select the members of the various subcommissions from places geographically near one another, so that the members may easily work together and obtain assistance from local organizers. If any additional subcommissions would in your opinion strengthen the work of your commission the Commissioners would be pleased to receive any suggestion in this matter.

The letter included four sets of names (although it did not name the subcommissions themselves, and indeed the fourth group was assigned only a number, 4, no names were listed). A correspondence containing a discussion of the candidates and Taylor's suggestions ensued. At last, on May 24, Smith wrote to Taylor:

> At a meeting of the American Commissioners held in New York on May 21, 22, the membership of your commission was considered very carefully. So far as possible the recommendations of the various chairmen were followed, the only exceptions being in cases where several requests had been made for the same men. A list of members for your commission was agreed to, with the understanding that you or the chairmen of the various subcommittees might veto the appointment of any members of their respective commissions if they desired to do so. Unless a veto is received by May 31 it will be assumed that you and they are satisfied with the membership, and a notification will be sent to each one whose name appears on the list. Commissions that have not already been filled will be filled from nominations that I am asking from the sub-chairmen. We shall thus have the commissions organized so that the sub-chairmen may take up the plan of work with their commissions before the summer vacation and arrange to begin work as soon as possible. I shall notify you of the results of my correspondence with the sub-chairmen on May 31.

The correspondence continued – names were suggested, certain subcommissions were eliminated or combined with others, certain subcommission heads withdrew from their positions and had to be replaced, and so on. In the final draft of the report, the committee chaired by Taylor was named "Committee No. V. The Training of Teachers of Elementary and Secondary Mathematics in the United States" and no longer addressed exclusively Normal Schools.

The nomination and approval of candidates required considerable political flexibility – the most varied wishes were expressed. Here, for example, is what the already mentioned Tyler wrote to Smith (April 28, 1909):

> I hope you will not think it too much an intrusion if I venture to add a word about the International Commission organization. I understand – whether correctly or not – that

> there is doubt as to asking Professor Moore of Chicago to be chairman of the Commission on Graduate Instruction, and that your two associates take opposite views on this question. Whether my understanding is correct or not, I take the liberty to say, as an Eastern man, that I believe it would be very unfortunate not only for the immediate work of the International Commission, but for the interests of the American Mathematical Society, if Professor Moore should not be invited to co-operate in some such honorable and important way. Please be sure that I do not intend this expression of opinion as in the slightest degree a criticism of any attitude or opinion of your own, I only want you to know in case you have to take the responsibility of deciding the matter that opinion will not be divided on purely geographical lines. I am the more inclined to say this because I came home from the New York meeting not a little concerned at the seemingly apathetic state of the local section which still bears the name of the American Mathematical Society. The men of the North Central states are now so numerous, and their Chicago section is so active, that it seems to me not only fair, but most important, that they should have liberal recognition.

Smith replied that he was in absolute agreement concerning "the men of the North Central states" but that Moore himself did not wish to become a committee head. Many problems of this kind arose. We will here confine ourselves to quoting a letter from Young to Professor Glover (probably James Waterman Glover (1868–1941)), whom the organizers were planning to appoint to an important role on one of the subcommissions, from June 17, 1909:

> I have just received information that seems somewhat to jeopardize the most effective formation of your subcommission. It is somewhat embarrassing to do so, but perhaps the best course is to submit the whole situation to you frankly and ask your opinion and advice as to the best course of procedure. It would seem desirable that your subcommission on the training of actuaries and statisticians should contain representatives of these professions as well as of that of teaching, now I am informed that the actuaries have the insurance laws of Wisconsin decidedly in their bad books, and that they connect you with those laws to such an extent that they decline to serve on the subcommission. Now the question arises of the best manner of dealing with the situation. Those at present appointed having declined, can other actuaries of standing be found that will serve? Or is it possible to deal with the situation adequately without actuarial representation on the subcommission? Trusting to receive your early service in this matter, I remain very sincerely yours.

On Young's suggestion (letter to Smith, August 10, 1909), the matter was resolved by abolishing the subcommission.

It proved much easier to form the Advisory Committee, which was only natural. To serve on it, the organizers planned to invite individuals who occupied prominent positions in various organizations and other prominent figures in mathematics and mathematics education (see, e.g., Young's letter to Smith from January 12, 1909). This honorary and unburdensome post was accepted with gratitude – the same Tyler, for example, described the difference between this membership and chairmanship in one of the committees as follows (he was offered both):

> I am certainly much honored by your dual invitation for service to the International Commission on the Teaching of Mathematics. As to the Advisory Council, I can only accept with pleasure, as to the chairmanship of the commission on Technical schools of collegiate grades, I am under obligation to hesitate a little, mainly on account of prior claims upon my time. (Tyler to Smith, April 8, 1909)

5 Spreading Information About the Commission's Work

The February 1909 issue of *School Science and Mathematics* already contained the Preliminary Report of the International Commission on Secondary Mathematics by Klein, Greenhill, and Fehr. This report was followed by a *Note of the Translator* by Louis Charles Karpinski (1909a) from the University of Michigan, which stated:

> Reform commissions on the teaching of mathematics and other branches have been active for several decades. Germany, France, England, Italy, the United States and even China have participated in the movement. It is a fitting culmination of this world wide effort that an international commission is to investigate the teaching of mathematics. This preliminary report of the Central Commission is destined to rank as one of the great milestones in the progress of the teaching of mathematics. So universal is its plan that it would readily adapt itself to investigations in the other fields of instruction. For this reason the report will interest all of those who work for improvement in teaching. (p. 113)

The same note contained the following announcement: "Official announcement is made by Professor F. Klein that the American delegates are the following: Professor William F. Osgood, Cambridge, Mass., Professor David Eugene Smith, Columbia University, New York City, Professor J. W. A. Young, University of Chicago."

The favorable attitude of the editorial board of *School Science and Mathematics* is detailed in the correspondence between the commissioners: in a letter to Smith from January 31, 1909, Young relates that, while discussing the prices of reprints of the Preliminary Report of the Central Commission, the editor explained that the journal sometimes did "missionary work" (the prices were subsequently indicated, but with the understanding that payment could take place when resources would become available – letter from Young to Smith and Osgood, February 6). Subsequently, it was agreed that the journal would be the official organ of the Commission, and this was announced in the May issue (International Commission on the Teaching of Mathematics 1909, p. 489), which stated that Smith had been elected head of the American Commission. Note that Smith's report (1909a) at the congress in Rome in 1908 was printed even before this announcement, in the March issue.

The sixth issue contained the "Preliminary Report of the American Commissioners" (1909), which stated the commission's objectives and described its plans. Some of its parts deserve to be reproduced here. The method of investigation, which the Commission planned to apply, was described as follows:

> It was resolved to carry on the investigation by means of various commissions and subcommissions, the chairmen of the latter constituting the members of the former. These commissions and subcommissions will consider part or all of the five topics set forth in the Preliminary Report of the Central Commission, viz.: (a) The organization of schools and the general relation of each kind of school to the others; (b) The mathematical curriculum in each type of school; (c) The question of examinations, from the point of view of the school; (d) The methods employed in teaching mathematics; (e) The preparation of teachers of mathematics. (p. 603)

Also noteworthy is a section entitled "The International Aspect." Here, the authors discuss the distinctive nature of writing for a foreign audience and list special and characteristic features of American education:

> Since the reports are destined for the educational public of many nations, it will be expedient to give a concise account of the salient features of our schools and the conditions under which we work, such as are usually tacitly assumed in our own discussions. Work in mathematics must be regarded and interpreted in the light of its environment, and our reports should furnish the readers of other nations with information respecting our educational system and conditions, analogous to that which we shall expect from them. America is unique in the liberty left to individual initiative in matters of education, and in the absence of authoritative central legislation and supervision. It is desirable therefore that the reports describe clearly the practical working of this freedom and its effect, good and bad, upon our progress in general and in mathematical education. We likewise stand alone in the complete separation of Church and State throughout our entire history, and an account of the effect of this on the work of education will be of interest to those nations that have faced or are facing serious problems in connection with religions instruction.
>
> We are also unique in the brevity of our educational history, and in the consciousness of living in its formative epoch, a consciousness that permeates all our activities. While it is not the aim of the Commission to study educational history or to tabulate statistics, it may be necessary, under American conditions, to do some work of this nature in order to understand the present and to forecast the future. Although the great central problems are fully stated in the Preliminary Report, we have others that are peculiar to ourselves, such as the education of the negro, and the training and Americanizing of the large number of uneducated immigrants constantly pouring in upon us. In all of these respects, the various reports should pay suitable attention to the international character of the work. (p. 604)

The report listed 16 commissions (their subcommissions were also named), each of which was to work on its own report: (I) General Elementary Schools; (II) Special Kinds of Elementary Schools; (III) Public General Secondary Schools; (IV) Private General Secondary Schools; (V) Normal Schools; (VI) Technical Secondary Schools; (VII) Miscellaneous Types of Secondary and of Elementary Schools (not included earlier); (VIII) General Question of Preparing Teachers of Mathematics for Public Schools; (IX) Examinations in Mathematics, other than those set by the teachers for their own class; (X) Mathematical Work in American Possessions; (XI) Influences Tending to Improve the Work of the Teacher; (XII) Technological Schools of Collegiate Grade, separate or connected with Colleges or Universities; (XIII) Other Professional Schools of Collegiate Grade, separate or connected with Colleges or Universities; (XIV) Colleges of Liberal Arts, and Universities, State and Endowed, Undergraduate Work; (XV) Graduate Work in Universities and in other institutions of like grade; and (XVI) General Survey.

The report explained:

> The order of procedure as to reports will be as follows: Subcommissions should first prepare their reports and submit them in typewritten or printed form through their chairmen to their respective commissions. The commission to which these reports are submitted should then prepare a report in typewritten or printed form based on the reports of the subcommissions and on any additional material that the commission may possess. (p. 607)

The Second Preliminary Report of the American Commissioners (1909) was published in the eighth issue. Noting that, since the time when the first report was published, the commissioners have held sessions in May and September 1909 and that work both in the United States and in Europe is proceeding apace, the authors express the hope that the subcommissions' reports will be submitted by

February 1, 1910. The importance of involving all interested individuals in the process is especially emphasized:

> Discussion of proposed reports. It is hoped that the proposed reports may be presented and discussed in as many meetings of teachers and mathematicians as possible, to the end that they may, when finally submitted, reflect the sentiment of the teaching profession and of the mathematicians of the country. (p. 778)

Next come enormous lists of members of commissions and subcommissions. Only 15 commissions are mentioned; there is no separate commission working on the General Question of Preparing Teachers of Mathematics for Public Schools.

Subsequently, the journal published no more articles as large and general as this one about the work of the commission; but it did not forget about the Commission, either. Thus, in 1910, it published a note by Young (1910) (the author is indicated in the index) about the current status of the International Commission, which, however, merely lists the participating countries and the members of their delegations. At a later time, the journal published an announcement (Reports of the American Commissioners 1912, p. 75) concerning the publication of the commissions' reports by the Bureau of Education and the possibility of obtaining these reports from the Bureau. An informational note concerning the meeting in Milan in 1911, albeit a very brief one, was published as well (The International Commission on the Teaching of Mathematics, Session at Milan 1912); it reported that "[n]one of the American members was able to be present" (p. 159) and listed the subcommissions that had been formed in Milan for investigating various questions. The journal also published a note by Young (1914, p. 185) about plans for a meeting in Paris – this note, however, provided only a schedule of sessions, mentioned the events being held at this time in Paris by various organizations, and reported about replacements in the membership of the French delegation (e.g., due to the death of C. Bourlet). In 1913, the journal printed a "List of Publications of the Central Commission and the National Sub-Commissions" (1913), which included the American publications as well and the note that they could be obtained from the Bureau of Education.

Of course, the American public was informed about the ongoing work not just by articles in *School Science and Mathematics* alone. Delivering a presentation at a joint session of the American Mathematical Society and the American Association for the Advancement of Science on December 29, 1909, Smith began his talk as follows:

> So much has been said and written of late concerning the work of the International Commission on the Teaching of Mathematics, and so closely connected are several members of the Association and this society with the movement, that I find myself quite at a loss in attempting to impart any new information as to the inception of the work and the general purposes in view. (Smith 1910, p. 1)

And indeed, the number of presentations and publications devoted to the International Commission and its American Subcommission was quite large. Without attempting to provide anything like a complete bibliography (indeed, putting together such a bibliography would be a useful undertaking in itself), we might note, for example, the article by Broomell (1908), which announced the formation of the International Commission (it is noteworthy that the attitude toward reforms expressed in this article is quite cautious – listing the commission's objectives, the author notes that "[i]t will also investigate the question of positive dangers in current reform movements in order to guard against these" (p. 16)).

Smith's article (1909b), also published in *The Mathematics Teacher*, informs teachers about the work of the American Commission, naming the committees that have been formed (15), as well as their subcommissions, and also the people taking part in them. The views expressed by Smith in this article about why the work should be organized specifically in this manner (by forming commissions) are worthy of note:

> The work in America has been organized on a different basis from that in certain of the European countries, and necessarily so. One reason for this difference is that we have nearly fifty state governments, each with its own system of education, a condition paralleled only by the German Empire, and even there to not the same extent. Another reason is found in the fact that educational matters are less settled with us than is generally the case abroad, so that we have no such bodies of accumulated material to which we can at once turn for information. Still a third reason for our different plan of attack is seen in the fact that we have not so large a body of trained university investigators in our teaching force, with time for preparing exhaustive discussions of special educational topics, as is found for example in Germany. The business opportunities of the new world are such that we shall not for a long time to come see relatively as many men of high intellectual attainments in the teaching profession as are found in the more densely populated countries. (p. 57)

The Mathematics Teacher continued to report on the activities of the Commission going forward, announcing its publications (Notes and News 1915). Articles about the Commission were also published in journals that were not devoted exclusively to mathematics education or not devoted to mathematics education at all. Thus, for example, the already mentioned historian of mathematics L. C. Karpinski published two articles (Karpinski 1909b, c) in *Science* and *The School Review*, respectively. The first of these opens with a quotation from Lincoln: "If we could first know where we are and whither we are tending, we could better judge what to do and how to do it" (p. 605); it is devoted to the program of the activities of the International Commission but also addresses the American delegation. Worthy of note is the subtle distinction drawn by the author at the end of the article between the work of the Commission and the propaganda of reform:

> Some may regard the work of the Commission as initiating a great reform movement. Reform does not come by commission; rather this development emphasizes the great movement towards vital instruction which has been in progress for over a century. The important work of the commission will be to gather together the valuable contributions from all the world and to make them available to all the world. (p. 606)

The second article, while describing the Commission's work, effectively elucidates what the author means by "vital instruction," adducing examples not only from mathematics but also from other subjects and explaining, for example, that introducing "sewing, cooking, and like subjects" into the curriculum is not the best method of humanizing the work of the school (p. 268). Instead, he believes that it is necessary, in ordinary school subjects (including mathematics), "to vitalize the instruction by using material real to the child at his stage of development" (p. 270).

Articles about the work of the International Commission continued to be published in the future and in other journals (e.g., Young 1912). It should also be added that the reports of the Commission themselves, in addition to being published in the Bulletin of the Bureau of Education, were often printed in other journals also.

6 Financial Aspects of the Work of the American Subcommission

The American delegation needed funding – the correspondence had to be paid for, and subsequently the publications as well, not to mention other things. Meanwhile, the initial plan, which was for the British government to approach other governments about financing the Commission's work, had fallen through. The British government could not be persuaded.

When work began, the projected estimate involved sums that were quite substantial. At least, in his letter to Smith from December 30, 1908, Young computes that the chairman must receive $2000 a year, with the other two commissioners receiving $1500 each; moreover, it was expected that these payments would be disbursed for 4 years and that additionally requests for traveling expenses and office expenses would also have to be made. The total request had to be for $31,400.

Smith in a letter to Osgood and Young from January 6, 1909, was far more realistic:

> Since sending out the memorandum of the informal meeting of December 26, I have ascertained that the United States Bureau of Education has altogether only $85,000 a year. Out of this it has to pay all of its expenses and has practically no margin.

In the same letter, he explains that the Commissioner of Education receives only $4500 a year and that the Bureau's budget allocates only $40,000 for research in education, concluding that "it manifestly impossible to expect any assistance this year." Even so, he suggests speaking with Commissioner of Education Brown and with Robert Simpson Woodward (1849–1924), who was at that time the president of the Carnegie Institution for Science, an organization established to fund and carry out scientific research.

Young emphasized that it was nonetheless necessary to estimate how much money would be required. In a letter to Smith from January 12, 1909, he wrote that it was necessary:

> to outline a full program of our work in considerable detail, and then prepare a budget of the amount of money needed adequately to carry it out. Until we have our program well outlined, we cannot present the importance and needs of our work effectively. We cannot even ourselves make a reliable estimate of our financial needs until our plans are much more thoroughly elaborated than they are at present.

Without waiting for such estimates, Smith on January 22, 1909, sent a letter to Brown, in which he wrote:

> In suggesting this International Commission on the Teaching of Mathematics at the International Congress of Mathematicians at Rome, it was the idea of those who took the lead in the matter that the expenses would not be so great that they could not easily be met. It was known that the International Congress had no funds beyond those needed for its own meetings, and it was thought that the work in each country could be done through associations of teachers of mathematics, at no great expense, a new problem has arisen, however: The European countries have taken up the matter officially, and the governments are allowing sufficient subventions to permit of a more thorough investigation that had at first been contemplated. In France, for example, it now looks as if some fifty subcommissions would be appointed to work up very carefully as many phases of the question. In Germany the government has come to the support of the investigation in a smaller way, and in providing for frequent meetings of the commissioners and for such expenses as may be necessary for a thorough investigation of the problem. The other leading countries will, I am informed, take similar steps, and the investigation will be entirely scientific and far reaching.
>
> Now the first practical question that our American Commission has to face is this one of finance, and while we presume that the Bureau of Education is not in a position to follow the European precedent at this moment, we know that your advice will solve, or assist materially to solve, the problem. For America to make only a perfunctory report, or for our Commission of three to make a report alone, however serious, would be to put our country in a most unfortunate position in view of what the other countries are doing. However self-sacrificing we may be, and however well-informed in the field of teaching mathematics, it is impossible to do this work alone or by mere correspondence. If France needs fifty subcommissions, we need somewhere nearly as many, for while we have not as many types of school we have a less homogeneous population and a greater diversity of educational systems, we also need money for traveling expenses of our Commission, and for printing, postage, and clerical help.
>
> We therefore appeal to you for advice. The National Educational Association has given up allowing subventions for national investigations for the time being, and it is not probable that it would allow funds for this international problem. The Carnegie funds are properly being guarded carefully, and help from these sources seems out of the question. Is it possible that Congress will now allow your Bureau the money denied last year, and can we assist in bringing any influence to bear in the matter, and could we hope for help in this direction if Congress should grant your request?

The matter was not resolved, however. In his response from February 10, 1909, Brown began no less graciously and diplomatically:

> Serious considerations have been given in this Office to your very frank and illuminating account of the present situation as regards the American division of the International Commission on the Teaching of Mathematics. We have tried to devise some way in which we could be of assistance in this work, for we realize the importance of proper American representation in this matter, and regard it is a movement to which the National Office of Education cannot be different.

Further, however, he explained that in previous years Congress did not give any additional money, and even if it gave additional money this year, it would not give more than $5700, which would clearly not be enough. The concluding part of the letter seems to go beyond the boundaries of customary politeness and expresses sincere regret concerning the situation:

> I feel a certain chagrin in being obliged to return such a negative answer to the far-reaching and important suggestions conveyed in your letter, but I can only tell you frankly our present situation and our moderate hopes for the future. I have been unable to get on the track of any private source of funds for such a purpose which is not already well known to you.

Smith did not give up, and on February 11, 1909, he wrote with an altogether modest request: "I am wondering if it would be possible for the Bureau of Education to assist us in any way with the printing and postage, making one of us an agent of the department for this work and allowing us to report to you."

On February 16 Brown made two modest proposals: to include questions that might be useful to the Commission on questionnaires that were regularly sent out and to allocate approximately $200 to pay for the report, which money might be used to cover expenditures on correspondence, with the Commission being given the choice of whether to publish its reports in the Bulletin of the Bureau of Education before they were published elsewhere. Even this arrangement, however, had limits: nothing could be paid to any agent not working for the Board.

The indefatigable Smith writes to the president of the Carnegie Institution for Science, Woodward. By that time, Woodward and Smith had already known each other for many years – we have their letters dating back to when Smith was working at Ypsilanti, Michigan. Woodward was elected member of the Advisory Commission of the American Subcommission (for which he expressed his gratitude in a letter to Smith from April 5, 1909). On May 3, 1909, Smith sent him a letter which effectively reproduced the letter sent earlier to Brown, laying out the Commission's financial needs. On May 4, Woodward replied:

> I have your letter of yesterday and regret to learn that your Commission finds itself hindered already by lack of funds. This appears to be the normal condition, however, of Commissions. It is likewise the normal condition of research institutions. Ours, indeed, is in danger of falling into a sub-normal state, for we are already feeling the pinch of poverty and may not appropriate during the present year an additional dollar for the new project. This may be a matter of surprise to you, since the current opinion is that we are under no obligation to live within our income.

Subsequently, however, he more graciously proposed to collect money by subscription and offered to give $50 himself (without going into a discussion of what such a sum would correspond to in today's money, either here or below, we would just remind readers that at the time it amounted to one ninetieth of the annual salary of the Commissioner of Education of the United States, as may be seen from the letter by Smith quoted above).

The correspondence and even meetings with Woodward continued. There was still no money, however. Smith did not want to rush to collect money by subscription (letter to Young and Osgood from May 11, 1909), but the idea came up of obtaining money from universities (first and foremost Teachers College, Columbia University, the University of Chicago, and Harvard). On May 13, Young wrote to Smith:

> I have taken up the question of a subscription in support of our work with the authorities of the University of Chicago, and I am authorized to say that this University will be one of three universities to subscribe $200.00 each toward our needs for the current year. I presume that with these subscriptions to head the list we should have no difficulty in securing

> smaller subscription from other Universities (and individuals?) sufficient to cover our most pressing needs.

In a letter to the other members of the Commission from May 25, 1909, Smith announced: "I am authorized to say that Teachers College will contribute $200 to meet the University of Chicago contribution, provided the other $200 can be raised."

It is clear that not a small role in the collection of money was played by President Butler of Teachers College, not least as an advisor who suggested effective ways of entering into contact with universities (letter from Smith to Woodward, November 8, 1909). It was decided to ask major universities to give $100 annually over the course of 3 years (1910–1912). And this plan was realized, although not without difficulties – the letters to universities did not go out in a timely fashion and had to be followed by reminders; some universities did not understand that they were requested to make not a onetime donation of $100, but to do so thrice; all such complications had to be attended to.

Generally speaking, financing continued to be problematic. In a letter from March 11, 1910, Young wrote:

> So far as I can see, our next resort would have to be individual contributions, and I have been thinking rather specifically of several Chicago people, any one of whom could easily take care of our entire budget if disposed to do so.

But no one was in a hurry to take the budget upon themselves. In a letter from March 8, 1912, Osgood, who alternated with Young in carrying out the duties of treasurer, mentions the following donations, about which he had received documentation from Young: In 1908–1909, $600 had been received – $200 apiece from Harvard, Columbia, and the University of Chicago. In 1909–1910, $1100 had come in – $100 apiece from Columbia, Cornell, Johns Hopkins, Princeton, Pennsylvania, Harvard, Chicago, the Catholic University of America, the University of Kansas, and the University of California and from President Woodward. In 1910–1911, only $225 had been received by that point ($125 of which came from individual subscribers); and in 1911–1912 only $100 (it may be supposed that this was not the final tally). Altogether, by that point $2505 had been received, while the outlays constituted $1601.60. After that point, another $892.37 came in, including $150 from the Bureau of Education, as well as sums from several universities and private individuals (including $100 from President Woodward), while expenditures amounted to $486.59.

Expenditures, as far as we can tell, consisted first and foremost of outlays on correspondence and on stationary. The commissioners' correspondence is filled with mentions of various committees requesting to be reimbursed for various expenditures (e.g., Smith's letter to the commissioners from July 5, 1910), although Smith in a letter to the commissioners from May 4, 1910, specifically reminded them that reimbursement to subcommissions – their postage and traveling – "was never promised" and also about their own outlays (e.g., Osgood's letter to Smith, May 13, 1914).

Without considering it necessary (or possible) to reconstruct a complete picture of the Commission's intake and outlays, we can say that the former were very limited, and we can suppose that the commissioners in addition made use of the possibilities presented to them by universities and possibly even their own personal resources. It may also be supposed that the shortage of resources had an influence on the Commission's work – for example, as manifested in the fact that American representatives were absent from important international conferences (although the committee members' heavy workload, of course, also played a role in this). In this respect, the following passage from a letter from Commissioner of Education Philander Priestly Claxton (1862–1957) to Smith, from December 10, 1913, is telling:

> It is too bad that your Commission can not be represented at the Paris meeting. There ought to be public funds for a cause of this kind. Unfortunately, there are not. I hope some day the Bureau may have funds enough to have work of this kind done in its name.

In general, when Claxton became Commissioner of Education in 1911, the situation began to improve somewhat. Claxton not only found funding to print the Commission's materials but also returned to the idea that the commissioners and collaborators of the Commission could work for the Bureau of Education. In a letter from December 13, 1912, Smith wrote to Claxton that the commissioners would be happy to be appointed to the Bureau on a minimal salary so that it will allow for mail. He also supported the idea of paying an honorarium in the amount of $250–$400 for publication in the Bulletin of the Bureau of Education. While noting that he did not expect that all of the Commission's expenses would be covered, he nonetheless expressed the hope that something would be paid by the Bureau for travel and for clerical expenses. On the same day, Smith informed the commissioners that he had met with Claxton and that the latter was ready to take them to work for the Department for 1 dollar per year which could give the opportunity to pay for postage and even travels and that he was also prepared to pay for the publication of bulletins.

To what extent this whole program was realized – that is, to what extent the Bureau of Education actually paid for postage and travels – is not clear. But what is clear from the surviving letters (Claxton to Smith, March 14, 1913) is that instructions were given to write out contracts to pay for the writing of at least some bulletins (although with the proviso that, if Carnegie would give money – which did not happen – then "the contracts may be cancelled"). All of this, however, occurred at the concluding stage of the work, when the main reports had been written and were being printed.

7 The Concluding Stages of the Commission's Work

The reports were gradually being prepared. The originally planned deadlines were not met, but the work moved forward. In a letter to the commissioners from October 15, 1910, Smith wrote:

> This letter is to keep you informed as to the status of this work. I have now in mind the reports of commissions Nos. I, II, III, IV, V, VI, X and part of XI. As for the others I think that we shall have to get someone else to take hold of commission No VII, but I am still in

> correspondence with the superintendent Elson. With respect to No VIII, this is practically ready, with the exception of the report of sub-committee 4. We are going to get this within a few days. With respect to No. IX, Dr. Atkinson has been in Europe, and before he went he had not been able to get any of the Possessions to render a report [for the Committee on Mathematical Work in American Possessions]. I have asked him if he will not send a brief report from his own knowledge of the situation. If this doesn't succeed, I think the Bureau of Education would take it up.

Consequently, the next order of business was editing and printing.

The commissioners read the incoming reports and exchanged observations about what should be corrected and how. Their positions were not identical in all respects, as can be seen from Osgood's letter to Smith from December 1, 1910:

> I return herewith your copy of Van Vleck's report. On some points you differ with the author. Is it your intention to try to have these passages modified before the final report is printed? If so, I suppose you will communicate directly with him. On the other hand, you have marked a large number of passages in which you appear to wish to have the English changed. It seems to me that except in the matter of clearness such editorial suggestions are of more than doubtful wisdom. One's language is a part of one's personality. Van Vleck has a strong personality, and his style is rugged and vigorous. In many instances the changes you suggest detract from the individuality of the style. Furthermore, there is the practical question of getting the writer to do what you wish in essentials, and of avoiding irritating him. The great things with which an editor has to do are the subject matter and clearness. He is handicapped in dealing with these matters effectively if he goes into unessentials. It seems to me therefore, that mere matters of wording had better be let alone. We have a task that will tax our powers to the utmost to deal successfully with the subject matter of these reports. We ought not to divert our energies into other channels. In the present case, I will make a suggestion, namely, that you send the copy of the report with your marginal notes to the author, and see how he reacts. In all cases I think the author ought to see the final form of this report.

As far as can be judged, questions that arose were usually resolved quite easily. At times, however, that was not the case. Probably the greatest difficulties arose in connection with the committee headed by the repeatedly aforementioned H. W. Tyler (No. IX. Technological Schools of Collegiate Grade).

Tyler himself was clearly of the opinion that his work did not require a great deal of editing. At least, when requesting additional time to complete his report (letter to Smith, March 23, 1910), he wrote as follows:

> I have ventured to suppose that the American Commissioners might be disposed to allow our commission somewhat more time than those dealing with work in the lower grades, with some presumption that we should present a report which might be incorporated in that of the Commissioners' without great modification. Perhaps I have assumed too much in this direction, and if so I count on your correcting me

The difficulty, however, arose not with him, but with one of the members of his committee, Alexander Ziwet (1853–1928).

After reading his report, Tyler wrote him a letter (July 20, 1910) on many pages with various apologetic expressions ("perhaps you may be quite right…"), explaining that the commission's task consisted first and foremost in describing the existing state of affairs, not in expressing one or another opinion (it may be supposed that Tyler's opinion was also different from Ziwet's). Later (letter to Smith from August

11, 1910), he complains that Ziwet is not willing to follow his recommendations – while all that Tyler desires is a report "which in its point of view shall fit in with the general plan for which neither of us is responsible." Later still, he complained that Ziwet simply does not respond to his letters.

At this point, the commissioners themselves had to intervene, and they had to do so without offending Ziwet and the members of his subcommission, who knew nothing about the conflict, and without ruining relations with the University of Michigan, where Ziwet was employed (which was a matter of particular concern for Osgood in his letter to Smith from January 30, 1911 – he even proposed that the report should be published and simply supplemented with addenda). Smith's stance was more decisive: he believed that "the relations with Ziwet were nice and Michigan was not involved" but that a report that everyone considers bad should not be published (Smith to Osgood, January 31, 1911).

The preparation of the report was assigned to another member of the commission, but now it also had to be decided whether or not Ziwet's name should be included among the members of the commission – the question was whether he would agree to stay on. A certain amount of correspondence was devoted specifically to this question, too. In the final publication, Ziwet's name does not appear on the list of the members of the committee, but at the beginning of the report we read (Committee IX 1911, p. 11): "Special mention should also be made of the cooperation of Professors A. Ziwet, of the University of Michigan and E. R. Hedrick, of the University of Missouri." Hedrick was initially a member of Ziwet's subcommission and refused to be listed among its members once Ziwet was no longer listed (Young to commissioners, April 4, 1911).

The reports had to be printed – an agreement concerning this, as has already been said, already existed with Commissioner Brown. The latter introduced the publication of the first report ("Graduate work in mathematics in universities and in other institutions of like grade in the United States") in the *Bulletin of the Bureau of Education* with his "Letter of Transmittal," in which, after briefly describing the establishment of the International Commission, listing its heads and the American commissioners, he continued:

> The Bureau of Education has assisted the commission by securing information from various institutions in the United States. Nearly 300 individuals who are engaged in giving instruction in mathematics have cooperated in preparing reports setting forth the present status of the subject in this country. (Committee XII 1912, p. 5)

But in 1911, Brown was replaced by Claxton in the post of American Commissioner, as has already been said, and it was mainly with him and his assistants that the commissioners had to work on publication – even the first report to be published, mentioned above, was prepared in collaboration with Claxton and his assistants. In this case, the commissioners found themselves in a new situation, in which others were editing a text that they had already approved. The aforementioned report, prepared by the committee on "Graduate Work in Universities and in other Institutions of Like Grade" under the supervision of Maxime Bôcher (1867–1918), became embroiled in a standoff that lasted many months.

The standoff began in July–August 1911, in the absence of both Smith and Claxton. Osgood, who was its main participant, in a concluding letter to Smith from October 4 presented the situation as follows:

> A commission made up of men of high professional standing has, at our request, made a report to us, and the report is a first rate piece of work, both in form and substance. The Bureau of Education has made changes in the proofs of two kinds: a) changes in the headings of paragraphs and in other typographical matters; b) changes in the text. As regards a), the board was, under our agreement, acting within its powers, and I accept their decisions. In regards b), they were acting ultra vires; I never agreed to a revision of the text of our report by them, not submitted to and accepted by us. I consider their action in this matter unjustifiable, and I ask that it be annulled. Had I foreseen such a contingency, I should not have been willing to ask a single member of the commission in question to give us of his time and thought. With the foregoing statement I herewith turn the matter over to you with power.

By this time, Osgood had already written numerous letters both to Claxton (who was in no hurry to respond) and to his deputy L.A. Kalbach – without much success. Claxton formulated his understanding of the situation in a letter to Smith from September 21, 1911:

> The proof of Bulletin 6, on "Graduate Work in Mathematics in Universities, etc.", has been held up several weeks, pending correspondence with Professor W.F.Osgood with reference to his corrections. This Office is anxious to accommodate Professor Osgood and the other members of the commission, so far as consistent with proper regard for the public interest. The galley proof was sent to your address May 24, and was returned by Professor Osgood June 30. Many of his corrections could be made easily, but there were many which would cause a great deal of expense and which in some cases would have caused a resetting of practically whole paragraphs.

He further explains that there exists a stylebook which must be followed, but Osgood wants to spell all the figures and center sideheads; this moves the entire paragraph. Claxton and his assistants suggested to delete some not important words but Osgood objected. Meanwhile:

> The Department heads, and the President himself, from time to time have issued special orders with reference to expenses for printing, and much complaint has been made with reference to corrections in proof.

Smith clearly wished to resolve the matters quickly and to use the planned meeting with Claxton to discuss other questions, but he considered it important to obtain his colleagues' approval. In a letter to Claxton from September 27, 1911, he wrote:

> I regret exceedingly that I have not been able to answer your letter of last Friday. As I stated to Mr. Kalbach in my letter on Saturday, I expected to be able to write early this week. It is, however, very desirable that I have the cooperation and approval of my colleagues on the Commission before I take the responsibility. I have no doubt that I shall be authorized by them to use my judgment, in which case, I shall settle the matter up instantly. As soon as I can hear, I will communicate with you. The delay is caused by the fact that the universities are just opening, and the two gentlemen are doubtless away from home.

And further:

> The work is a very important one, and I am anxious that our country should not be in any way behind others in the results of the investigation.

The issue of corrections was ultimately resolved. But other organizational questions arose.

One of them concerned the distribution and sale of the prepared publications. The matter was not a simple one. Claxton, in a letter to Smith from December 13, explained:

> I beg to advise you that this Bureau is not authorized to sell any of its publications. The only government officer authorized to sell our publications is the Superintendent of Documents, Government Printing Office, Washington, D.C., and under the law he cannot sell more than one copy to the same person, excepting Members of Congress, but he may sell quantities to libraries or schools. I would suggest, therefore, that if it is desired to sell copies of the reports contained in the bulletin of the Bureau of Education that arrangements be made through the Superintendent of Documents. I am enclosing herewith one of his price lists, on the last page of which may be found some information respecting the sale of publications.

The publications were printed in large numbers of copies (at least, for editions of this type). We quote a letter from Smith to Claxton from December 18:

> the edition of Bulletin No.9 (Committee IX, on Technological Schools of Collegiate Grade) is nearly exhausted. It seems that only 3500 copies of this bulletin were printed. We sincerely trust that another edition may be prepared without delay for this reason that the demand for these bulletins have hardly begun as yet. There is sure to be a large demand abroad as well as at home not only for this particular number, but for all of the others. This demand will, we feel sure, be especially great for the report on elementary and secondary schools. We therefore suggest the desirability of enlarging the edition to 5000 of all reports, and to 6000 in the case of the elementary and secondary schools.

New plans arose as the reports were being printed. There is basically no mention in the literature on the history of mathematics education of the following project, which Smith described in a letter to Claxton from November 22, 1912, shortly after meeting with the other two commissioners:

> As you long ago suggested, the next great move is to compare carefully the work done in all other countries with that done in our own, and to see wherein they have any advantage over us. We feel that this should be done not alone in the general type of school, but in such schools as give particular attention to agriculture, local industries, special lines of work, and the like. It should be followed by a few carefully prepared curricula in mathematics, based on the results of this comparison, that should set forth in a sane, conservative, actually-workable fashion the best that any of us suggest.

As has already been stated, Smith asked for certain funds in order to implement this project, and these were given, at least in part.

The years 1914–1915 saw the publication of survey articles by J. C. Brown (1915), "Curricula in Mathematics. A Comparison of Courses in the Countries Represented in the International Commission on the Teaching of Mathematics" (Bulletin No. 45 of 1914); E. H. Taylor (1915), "Mathematics in the Lower and Middle Commercial and Industrial Schools of Various Countries Represented in the International Commission on the Teaching of Mathematics" (Bulletin, No. 35); and I. L. Kandel (1915), "The Training of Elementary School Teachers in Mathematics in the countries represented in The International Commission on the Teaching of Mathematics" (Bulletin No. 39). Later, a study by Archibald (1918), "The Training of Teachers of Mathematics for the Secondary Schools of the Countries Represented in the International Commission on the Teaching of Mathematics" (Bulletin No. 27), was published.[2] Note that survey studies based on the materials of the International Commission that encompassed the whole world and all languages were very few in number, which makes these articles of particular interest.

The commissioners edited these articles too, and their remarks also shed light on their objectives. Correspondence has survived concerning the facts about Russia laid out in the report by J. C. Brown. In a letter to Brown from October 20, 1914, Young wrote:

> I looked up the Russian report, and was somewhat surprised to find a considerable number of statements in our report for which the Russian report does not seem to furnish authority, I have changed the wording on the proof so as to meet this criticism, I suggest to strike out the words "said to be", since they may be taken to imply that we do not have full confidence in the statements of the Russian report. The statement about which I wrote you first, namely, "The idea of definite integrals is presented and in some classes the idea of indefinite integrals is given some attention", I do not find in the Russian report either in this form or in the form to which it was changed on the proof, namely, "the idea of definite integral is presented in many schools and in some classes the idea of indefinite integral is also given some attention". All that I find in the Russian report on this matter is (p. 10) "Concept of definite integral. Application in computation of areas. Concept of indefinite integral". Nothing at all about "some classes", which was what first attracted my attention, nor about "many schools". Nor does the Russian report say that the subject of maxima and minima is emphasized, nor that geometric representation etc. receives a good deal of attention. Of course I see how these statements got in. In accordance with an excellent and worldwide custom, the Russian report simply gives a list of topics without verbs, the verb being implied by the fact that they are given as the topics taken up. As our report has been prepared on the plan of using a verb with each topic, and as there are only a few different verbs that are really synonyms of "taken up", the temptations is naturally great to seek variety in the use of other verbs, like those cited above, that make stronger statements than the original warrants, and that thus may convey an incorrect impression of the distribution of emphasis in the work. I am much perturbed by the possibility that the material of the countries in whose work Americans are perhaps interested more actively than in that of Russia, has been presented similarly. It seems to me that the entire report should be compared with the originals as I have compared this particular section, and if the matter were still in manuscripts, I should feel no other course to be open. But as things stand I have finally decided (as mentioned at the outset), to send the matter on to Washington in the present condition.

Smith was away at the time (in England), and in his absence Brown wrote to Young (quoted in Young's letter to Smith, November 7, 1914):

> I put the words "said to be" in the Russian report with thought and intent after a conference with Dr. Smith. I do not believe parts of the report nor does he. In order to protect ourselves that wording was inserted, it may have been an unwise choice of words but it conveys the idea. I consent to striking them out if you think wise. Instead of striking them out it might be well to use them oftener in other reports which we know to be unreliable, as for example, the U.S. report in some places. Any change that you think wise here will, however, meet with my approval.

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[2] The list of the Commission's publications in *L'Enseignement Mathématique* (Commission Internationale 1920–1921) also includes papers by Smith and Goldziher (1912), Young and Smith (1916), and Smith and Seeley (1918), which will not be examined in this chapter.

Young did not like this and he wrote to Smith (November 7, 1914) as follows:

> In reply to Brown's views, I would say that his report professes to be a digest of the reports submitted at Cambridge and we are responsible only for correct citation of those reports. We "protect ourselves" if need be by detailed references to those reports as the authority for the statements of ours, but we assume no responsibility, expressed or implied for the accuracy of the reports submitted at Cambridge by other nations. Of course, if we think a nation has misrepresented conditions within its borders and submitted an "unreliable" report, it is open to us to point this out to the world but I should hesitate at doing this in the digest of the Cambridge reports that is to be a part of our national, official report to the next Congress. It would seem better that such things should be done unofficially in the form of a critical discussion by some individual who knows personally the conditions in the country in question. Whenever and however done, I should like to see not vague implications but a specific presentation of; (1) The inaccurate statements; (2) The correct statements that should have been made; (3) The authority on which (2) is based. The charge that the reports of the U.S.A. are "unreliable" is a serious one and comes directly home to the American Commissioners. I am asking Brown, per the enclosed copy, to substantiate his general charge by details presented along the lines just mentioned.

But already 10 days later (on November 17), Young wrote to Smith: "I note that you approve of striking out the words 'said to be' from the Russian account, which is the only question not of a routine character concerning Brown's Bulletin." And the text went to press.

8 The Prepared Reports

Altogether (not counting the survey reports mentioned above), the following reports were published (American Commissioners 1912, p. 77):

Report of the American Commissioners of the International Commission on the Teaching of Mathematics.
Committees Nos. I and II.—Mathematics in the Elementary Schools of the United States.
Committees Nos. III and IV.—Mathematics in the Public and Private Secondary Schools of the United States.
Committee No. V.—Training of Teachers of Elementary and Secondary Mathematics.
Committee No. VI.—Mathematics in the Technical Secondary Schools in the United States.
Committee No. VII.—Examinations in Mathematics Other than Those Set by the Teacher for His Own Classes.
Committee No. VIII.—Influences Tending to Improve the Work of the Teacher in Mathematics. ,
Committee No. IX.—Mathematics in the Technological Schools of Collegiate Grade in the United States.
Committee No. X.—Undergraduate Work in Mathematics in Colleges of Liberal Arts and Universities.
Committee No. XI.—Mathematics at West Point and Annapolis.
Committee No. XII.—Graduate Work in Mathematics in Universities and in Other Institutions of Like Grade in the United States.

They were printed not in the order of the issues, but in the order in which they became ready. And it is easy to see deviations from the original plans: certain committees, for example, those connected with teacher education, were merged, while on the contrary there were initially no plans for a committee whose name mentions West Point (although there were undoubtedly plans to discuss the military academy itself in the context of another committee with a different name).

It is obviously impossible to analyze all of these publications within the bounds of the present chapter, even though such a discussion would be quite useful. We will confine ourselves to a brief examination of one of the reports (Committee No. III – Public General Secondary Schools) and of the Report of the American Commissioners.

8.1 *The Report of Committee No. III*

The Report of Committee No. III was published in the same issue as the Report of Committee No. IV, which worked on private schools, under the umbrella name "Mathematics in the Public and Private Secondary Schools of the United States" (Committees III and IV 1911). The report on public schools appeared on pages 11–112 of the issue, while the report on private schools appeared on pages 113–187. The issue opens with a list of the Committee's members and subcommissions.

There were nine subcommissions: (1) Boys' Schools, (2) Girls' High Schools, (3) Coeducational High Schools in the East, (4) Coeducational High Schools in the Middle West, (5) Coeducational High Schools in the South, (6) Coeducational High Schools on the Pacific Coast, (7) The Preparation of Teachers of Mathematics for the Public High Schools, (8) The Six-Year High School Curriculum, and (9) Failures in the Technique of Secondary Teaching of Mathematics: Their Causes and Remedies.

Among the members of the committee – including members of the subcommissions, who were 51 in number – teachers formed an absolute majority; the report indicates that 36 individuals worked in high schools and 3 more in Latin schools (the place of employment of the committee's chairman, George W. Evans, is indicated to be Charlestown High School, Boston, Mass). Seven individuals are described as professors, and several others are described as employees of universities or their place of work is not specified. Eleven committee members are referred to as "Miss" and one more as "Mrs." The organizers clearly attempted to create some geographic diversity (as is evident, e.g., from the names of the subcommissions), but they did not fully succeed – 16 individuals, including all the members of the Committee itself, rather than its subcommissions, were from Massachusetts; 7 were from New York; 5 were from Missouri; 3 were from California; and 2 were from each of Michigan, New Jersey, Ohio, Pennsylvania, and Washington. Tennessee, Washington, D.C., Kentucky, South Dakota, Oregon, Texas, Iowa, Nebraska, Illinois, and Georgia were also represented. The variety of representation is impressive.

The report opens with a General Report, which is followed by the reports of the subcommissions. The General Report contains the following sections:

Organization
The curriculum
The subject matter
The orthodox syllabus:
I. Algebra to quadratics
II. Quadratics and beyond
III. Plane geometry
IV. Solid geometry
V. Trigonometry
VI. Advanced algebra
VII. Arithmetic
Growth of the college requirement: Harvard College as example
Recent progress
Examinations
Methods
Aims

Each section is in turn divided into subsections, whose goal is to describe various aspects of the existing reality (often without any commentary). For example, the penultimate subsection of the section "Organization," which is devoted to general questions, reads as follows:

> *Racial restriction*.—Throughout the South negroes are excluded from the high schools where white pupils are taught. In certain localities separate high schools are provided for the negroes; work done in them is, with very few exceptions, of a distinctly inferior character. (Committees III and IV 1911, p. 15)

To be sure, at times the accepted tone of "objective description" cannot conceal the authors' feelings. Let us quote, for example, the subsection that precedes the one just quoted:

> *The teachers*.—The best of the high-school teachers of mathematics, with rare exceptions, have no more knowledge of mathematics than would be indicated by a 1 year's course in the calculus. The great majority of them have not even that. Standards are, however, improving, the principal obstacle being ignorance and indifference on the part of educational authorities. (p. 15)

In the section "Curriculum," the authors return to the quality of teachers, addressing the special role of textbooks:

> *The textbook as evidence.*—The fact that few of the high-school teachers of mathematics are thoroughly trained in their subject and that the subject matter is settled for the most part without their initiative indicates that the content of the curriculum will be closely defined by the textbooks used. This is also the comment of publishing houses in discussing new textbook projects: "We must have a book that the ordinary teacher can follow without change; it is only the exceptional teacher that can strike out independently of its guidance." (Committees III and IV 1911, p. 17)

And consequently, they go on to describe the canonic content of mathematics education ("The orthodox syllabus"[3]).

Subsequently the authors write about the increasing requirements for admission to universities, which occurred alongside of and interconnectedly with changes in the content of education. As the authors note:

> In the textbooks of algebra 50 years ago much more stress was placed on logical exposition than on the solution of problems. The development of arithmetic, as followed in the textbooks of the elementary school, was faithfully imitated in algebra, and various "operations" (some, like the square and cube root of polynomials, having no conceivable use, and other mere pedantic elaborations of methods that in simpler form were well worthwhile) were laboriously discussed and exploited before the use of equations in discussing problems was entered upon. (Committees III and IV 1911, p. 23)

The situation began to change gradually, in their view, and exercises and problems began to be given a far greater role to play. In general, the authors believe that "[i]n the last 10 years changes in the details of high-school mathematics have been radical and rapid. They are largely the result of the active interest taken in the work of high school teachers by university professors, and of the conference between high-school men of different localities" (Committees III and IV 1911, p. 24).

It may be surmised that the authors see changes first and foremost in the transformation of the content of education, including its sequencing and other similar aspects. However, they also write separately about the appearance and popularity of what they call the "methods" of education (devoting a separate section to them). Among these, they regard the following five as the most popular: measurement and computation, laboratory method, use of models, use of cross-section paper, and individual method. And subsequently these and other methodological methods and questions are briefly discussed.

Finally, in the last section, the authors discuss the general aims of mathematics education in high school, noting that "[t]he aim of high-school education, so far as mathematics is concerned, is general culture, and at the same time is preparation for college" (p. 34). The authors assiduously elaborate this view, emphasizing that mathematics is not by any means studied in order immediately to apply the acquired knowledge in practical activity. The contemporary graduate "is brighter and keener [than his grandfather], because he has been educated, and he has self-reliance because he has done things by his own thinking power; but he has had nothing directly contributory to the special knowledge or aptitude required for these occupations that he may follow" (p. 35). This section and the general report as a whole conclude with observations about the need for further study of how effectively teaching is being conducted and how successfully the desired objectives are being attained.

[3] Let us note at once that not only in the standard old curriculum but also in the proposed plans relatively little was said about including the ideas of calculus in the school course, although, of course, this topic was also touched upon. The report of one of the subcommissions of the same Committee III states: "A movement has developed in the Middle West for the introduction of two years of graduate work in the high school, covering approximately the first two years of college work. In mathematics this necessitates the teaching of analytic geometry and differential and integral calculus in addition to all the courses of the traditional curriculum" (Committee III and IV 1911, p. 92).

The first general report generalizes the separate reports of the subcommissions and can serve as a brief version of them (at least to some extent). These reports have largely the same format – from the organization to the goals – although of course they have their distinctive characteristics. This chapter will therefore offer only a slightly more detailed discussion of the concluding section of the Committee's report, the ninth subcommission's account of "Failures in the Technique of Secondary Teaching of Mathematics: Their Causes and Remedies."

Let us say at once that from a stylistic point of view, this report is written in an altogether different manner than the one examined above. Its very first sentence – "In this commercial age, which makes efficiency the controlling factor in all walks of life, the teacher must not expect to escape a searching scrutiny of his results or criticism of his methods" (Committees III and IV 1911, p. 94) – shows that the authors are not opposed to engaging in reflection and contemplation, nor do they have anything against elegant turns of phrase. This does not mean, however, that they make no use at all of scientific methods of research. On the contrary, they diligently sent out questionnaires and collected 125 answers (although it is not entirely clear to what extent these were used – it appears that the summary of the answers, which they intended to publish, was not published). In addition, they used the statistics of two examining bodies, the Regents of the State of New York and the College Entrance Examination Board.

As a result, they reached two conclusions:

1. Mathematics is not taught more poorly than other secondary branches.
2. The results are not satisfactory.

In support of the second conclusion, they write:

> The second conclusion would be even more obvious if the percentage of failures included the pupils who dropped out during their course, i.e., if it were based on the initial registration of the school. Evidently from 40 to 50 per cent of all students pursuing mathematical work in secondary schools do not complete their work satisfactorily, if examinations can be trusted to determine the pupil's mental equipment. (p. 96)

Here, the authors with great sarcasm discuss the proposals, which had appeared in response to obvious failures in the teaching of mathematics, to make the teaching of mathematics nonmandatory; and quoting from a paper by the chair of the subcommission (and hence the report's lead author), William Betz, they discuss both the theory of social efficiency and the new theories of mental discipline and general training. In the process, they note that "the high school population [was made] more diversified than ever before, and the demands imposed upon the schools have become more numerous from year to year. *For the first time in history, secondary education is truly democratic*" (p.98).

Turning next to an analysis of the causes of failure, they name inadequate teacher preparation as the first among them:

> How many high-school teachers of mathematics at the present day have ever studied analytics, not to speak of the calculus? How many have ever seen Crystal's Algebra, or Hilbert's Foundations of Geometry, or have read the pedagogical works of Smith or Young? (p. 101)

They place special emphasis on the shortage of professional contacts that might give teachers what their inadequate preparation has failed to give them and on the bad position in which teachers find themselves in terms of being overloaded with work and underpaid, all of which hinders improvements.

The students themselves – who often are not sufficiently mature and who want to do nothing but enjoy themselves – also get blamed. However, clearly recognizing that blaming children for this is unlikely to be helpful, the authors conclude that "[l]ack of home training is responsible for much of this. A real educational crusade must be begun to convince parents of the necessity of careful moral and social training of their children" (p. 103).

Another cause lurks in the defects in school organization: "The fact is that the high school has outgrown its present form of organization." In this connection, the most varied shortcomings are mentioned, from lack of time to study geometry to the careless planning of many other details, including the failure to apply what has been learned.

The authors declare that:

> The one-sided doctrine of mental discipline must go. There need not be any antagonism between theory and practice. Neither Euclid alone nor Perry alone should be our guide. We ought to have a fusion of the abstract and the concrete, a fusion dictated by common sense and free from radicalism in either direction. A teacher who dwells exclusively on half-comprehended, nonproductive subtleties is as much to blame as one who emphasizes merely the How and not the Why. Real applications should be introduced systematically, but the acquisition of a satisfactory technique must not be allowed to suffer. (p. 104)

The authors criticize the system of "recitation," as well as "a national policy" that grew out of the "misunderstood maxims of Rousseau, Fröbel, Jacotot" (p. 105). They see a positive model in European (above all, Prussian) schools, with their practice of having the whole class work together. They discuss the need to increase the time allocated for the study of mathematics, offering the following considerations (which merit attention in themselves):

> (1) We must get away from mechanical textbook teaching.
> (2) The prevalence of "laboratory methods" consumes more time. The spirit of discovery is inconsistent with machine routine.
> (3) The old curriculum paid almost no attention to the demands of actual life. It ignored applications.
> (4) The requirements of the higher institutions and of the professions are becoming more intensive and extensive.
> (5) The complexity of modern life furnishes so many distractions to the young student that more thorough teaching and more reviews are necessary than formerly. (p. 107)

Thus, what we have before us is not so much a report that describes a state of affairs, as a passionate article which in effect passionately calls for moderation and the use of various new ideas, without however going to extremes. Yet its very tone underscores the urgency of the existing problems.

8.2 *The Report of the American Commissioners*

Just as the general report quoted above summarized the reports of all the subcommissions, so the Commissioners' Report undertook to summarize the reports of all the commissions. Again, this does not mean that it introduced nothing of its own or nothing new. The report contained the following large sections (in addition to them, there were various introductions, appendices, and indices): (I) general American conditions, (II) mathematics in the elementary school (i.e., up to eighth grade), (III) secondary schools, and (IV) mathematics in the higher institutions of learning. For us, the first three are of greatest interest. The whole report takes up about 60 pages and, together with the supplements and indices, over 80.

The authors are supporters of reforms and transformations but at the same time note that:

> Taken as a whole the country is very conservative in the matter of change. It may appear to be teeming with experiments, but one school striving to pioneer a new and supposedly better road attracts more attention than a thousand quietly following the beaten path. To introduce a change generally throughout the country requires not only that the same question be argued out in a thousand independent forums, but also that in each the spirit of conservatism be overcome. (American Commissioners 1912, pp. 12–13)

More generally, at the end of the section devoted to secondary education, the authors mention "the waste of effort involved in independent and often inadequate treatment of fundamental and broad questions by separate schools, colleges, or local systems" (p. 40) as one of the two most important problems (along with improving teacher preparation). However, they see the way to rectify this problem not in any radical administrative restructuring, but in the appearance of "recommendations that would have a moral authority."

Among the changes about whose importance to elementary schools the authors emphasize is the transformation of the course in arithmetic with a view to ceasing to teach narrowly focused techniques for various professions but instead giving "a sufficiently wide range of the applications of arithmetic to prepare the pupil to master these technicalities for himself when he enters upon his life work" (p. 16). They also underscore the influence of psychology, under whose impact the need to "arouse the interest and to meet the immediate needs of a child" became clear. Much room is devoted to the question of teaching algebra and geometry at an earlier age – that is, of introducing them in elementary school – in eighth grade or earlier.

The commissioners consider it important to avoid what they call "The Danger of Uniformity" (p.20), explaining that the fact that "all men are created equal" by no means signifies that everyone must be taught equally. The movements opposed to such uniformity also turn out to be no better:

> In all of these movements, however, the first thought has been given to the pupil who does not wish to learn mathematics, or at most to the apathetic one, rather than to the one who wishes to learn. Our uniformity in the past led to mediocrity, and our specializing of the present is only for the boy or girl who is looking for the purely utilitarian. (p. 21)

The authors go on:

> It would seem that a desirable step in elementary public education would be to make some provision for the pupil who wishes to progress more rapidly in one or more lines of serious study. It is possible that some plan may be evolved that will allow us, at the end of the first six school years, to differentiate our pupils, requiring all to take at least as much mathematics as at present, but allowing a select group to proceed more rapidly and to cover more ground. (p. 21)

Without going into other issues raised by the authors, let us pass to secondary education. In this connection, the authors repeat an idea that we have already encountered, namely, that the content of education is in reality determined by entrance exams to universities. Among the changes in education that were being discussed in the country, probably the one discussed at greatest length in the report is the combined study of algebra and geometry. Still, far more important seems to be a discussion, which begins under the heading "Aims," concerning a tendency supported by recent psychological studies to look in a new way at the value of mathematics as a "formal discipline" and "a tendency to attach greater importance to the utilitarian possibilities of mathematics." The authors' position is unequivocal:

> The very variety and importance of the uses of mathematics in trade and industry may tend to foster the opinion that the learning of such uses is the chief end of the teaching of mathematics. This is, of course, no more the case with respect to mathematics than it is with respect to less utilitarian subjects of the curriculum. History and English literature are taught not because they can be directly used in earning dollars, but because the educated person should know something of these fields and because the mind of the pupil will grow along desirable lines through thinking their types of thought. Mathematics is taught for quite similar reasons. Its utilitarian possibilities should not cause us to forget that the main purposes of its teaching are to acquaint the pupil with the content of a portion of a domain of thought that is fundamentally characteristic of the human mind as such, and not of any particular time, place, or civilization, and to cause his mind to grow along desirable lines by actually thinking in the type of thought that is characteristic of this domain. (pp. 32–33)

A comparatively large amount of attention is devoted in the report to teacher preparation. The authors note that "the systematic training of secondary teachers in this country" began only around two decades prior to the writing of the report. This is how the authors saw the minimum requirements specifically for the preparation of teachers (after certain general improvements in teaching at the college level):

> (a) Trigonometry, college algebra, analytic geometry.
> (b) Surveying, or descriptive geometry, or elementary astronomy.
> (c) The differential and integral calculus with applications to geometry, mechanics, and physics.
> (d) Modern geometry.
> (e) The elements of analytic mechanics.
> (f) The elements of theoretic and laboratory physics.
> (g) Algebra from a modern standpoint.
> (h) One or more courses introductory to important fields of modern mathematics.
> (i) One or more courses in the history of mathematics.
> (j) One or more courses on the teaching of mathematics. (pp. 37–38)

The authors also place special emphasis on continuing education for teachers who are already working in schools – and they believe that textbooks have an important role to play in this respect.

The report concludes, as has already been said, with appendices, which list all of the established committees and describe the history of the International Commission.

8.3 On the Generalizing Publications

As has already been said, the commissioners organized the preparation and publication of generalizing studies. These studies were, naturally, not identical in style and execution, but a detailed analysis of their similarities and differences, as well as a detailed discussion of even one of them, is hardly possible within the scope of this chapter. We will confine ourselves to a brief discussion of the last published book (bulletin issue), Archibald (1918).

This issue contains almost 300 pages, and the text is organized as follows: first comes an Introduction, which tells about the International Commission and about the prepared reports in general; then follow 18 chapters, each of which is devoted to some country taking part in the International Commission; then comes a chapter with the title "Summary and Comparative Remark"; and finally come various appendices (including in German and French) about the United Kingdom, France, Germany, and Japan – it is natural to suppose that the writer of the report considered these countries of greatest interest to the American reader.

The reader can note at once that, despite the fact that the volume is titled "The Training of Teachers of Mathematics," this is not by any means the only topic that it addresses. For example, the chapter on Russia contains rather detailed discussions of the mathematics curricula of gymnasia and real schools, and of universities in general. When possible, the author draws information from sources that are by no means limited to the commission's publications. Thus, in the same discussion of Russia, only three reports of the Russian subcommission are quoted from (although it would have been opportune to mention at least two others), but three other publications in French by the well-known Russian historian of mathematics Bobynin are used, as are also an American and a British publication. Admittedly, in the short chapter on Romania, only the national report for the International Commission (16 pages long) is used; but this whole chapter takes up only two pages.

Of greatest interest evidently is the last chapter, which is comparative. However, even here a considerable part is taken up by a summary, that is, by what is essentially a rehearsal of what has already been said. Russia, for example, is given two paragraphs, the first of which describes the requirements for admission to universities and the mathematics courses at universities; the second paragraph reads as follows:

> It was not till recently that any provision was made to give professional training to candidates for teaching positions in State secondary schools. This beginning was made in 1909, when a year course including lectures in logic, psychology, pedagogy and its history, as well as practice teaching, was organized for the arrondissement of Petrograd. (p. 221)

An attempt to compare and reflect is undertaken only at the very end (in the conclusion), and even here, citing the brevity and insufficiency of the sources, the author remarks that "[i]t is therefore only in a very general way that definite statements may be made in comparing the methods of different countries" (p. 223). Consequently, the author prefers to compare numbers. For example, the ages of those who enroll in universities:

> We remark that in 15 of the 18 countries the normal age of entering the university is 18 or 19. These countries are: Austria, Belgium, Denmark, England, Finland, France, Germany, Hungary, Italy, Netherlands, Romania, Russia, Sweden, Switzerland, and the United States. When the extent of secondary school preparation for the university is considered, we find wide variation of custom. Australia and the United States are at the foot of the list with only 4 years; but 7 countries (Austria, Finland, Hungary, Italy, Japan, Romania, and Russia) devote 8 years, and 3 countries (France, Germany, Sweden) 9 years to secondary education. (p. 224)

Here, however, the authors comments that the time spent on studies can be apportioned in different ways: in Germany, only 19.8% of the time is devoted to mathematics, the sciences, and drawing, while in France students spend about 36.8% of their time on these and similar subjects (in lycees specializing in mathematics).

Next, the author compares the amount of time which the future teacher must spend at the university: from 8 years in Sweden to 3 years in certain other countries. He also compares the time allocated to professional training (and its mandatoriness). Finally, mathematical preparation is also brought up; in this connection, the author notes that:

> When the courses required for the candidates in different countries are considered, the unenviable conclusion is reached that Australia, England, and the United States are largely in a class by themselves. For in these countries mathematical teachers know practically nothing of their subjects, as they have had no special mathematical training in the universities. (p. 226)

In conclusion, the author discusses the general situation of teachers:

> On the whole, the salary, pension, social position, and scholastic status of the secondary-school teacher in France and Germany seem to combine to give to the profession an attractiveness not to be found in other countries. (p. 227)

9 The First World War and the Subsequent Development of the Commission's Work

With the outbreak of the war, the commission's work, which was in any case nearing its end, did not change very much. In the already quoted letter from Young to Smith from November 7, 1914, in the midst of a discussion of all kinds of work-related details, Young melancholically remarks that this is his third letter since the beginning of the war; but much more room in the letter is devoted to the writing of Brown's report.

At the beginning of the war, Klein proposed that he would resign the presidency and inquired whether Smith would be able to take his place. Smith replied that it was unlikely that anything could be done at the present time (letter from Smith to the commissioners from April 28, 1919).

Young then expressed support for a "soft" transition of the post to Smith. In a letter to the commissioners from March 12, 1915, he wrote:

> As to Klein's continuing in the Presidency, I think I need add nothing at this time to my letter of February 10th, sent to you both. Our Chairman has handled the situation with his usual tact and effectiveness. His able work and rare personal qualifications for leadership were enthusiastically recognized by the entire Commission and by the Congress at Cambridge. I believe that the commission stands ready to accept his leadership because its members have learned in various ways but especially at Cambridge, to see in him the one man preeminently fitted for the leadership. The war has doubtless made it easier for Europeans to accept American leadership, but I should like to see this post come to Smith because of his personal fitness for it and not as a windfall of the war. The mode of procedure, in fact the whole question, is one for the central commission to determine, but if I were a member of the commission I should propose for consideration the plan of announcing that owing to ill health of President Klein (and perhaps also on account of difficulty of postal communication with Germany) Vice president Smith will be Acting President until further notice. Then if Klein should later relinquish the presidency altogether, I should like to see Smith made President as Smith not as a "neutral."

In a letter from Young to Smith from May 24, 1915, Young elaborated his position:

> Since writing you last, Klein has been expelled from the French Academy in the last batch. I feel more convinced than ever that you were right in saying that the main thing for us to do at present is to keep from quarreling among ourselves. Perhaps the best way to do this is to maintain the status quo ante bellum. There is little Presidential work to be done now; a Vice President can, as such, take up any part of this work that circumstances may make it desirable for him to do. It would be unfortunate to increase the difficulty of the German participating in the work of the Commission after the war, by any action with respect to Klein that they would resend.

In 1918, he again returns to the general situation with the International Commission (Young to the commissioners, January 30, 1918):

> The Commission is far from being out of existence as yet. There will be another Congress sooner or later, and to it the Commission must make its report. Then once the war is ended, the Commission will doubtless soon resume active work. Our branch must not only do the local share, but will probably have to take a leading part in the international phases of the work since we have as Chairman the Father of the Commission idea, who also has perhaps a wider personal international acquaintance than any other member. Presumably the next congress will discharge the Commission, but it is quite conceivable that post bellum conditions may lead to the continuance.

The idea of giving the presidency to Smith was revived after the war, while recognizing the dangers of the frenzy that had taken hold of the victors. On May 3, 1919, Osgood wrote to the commissioners:

> Your letters have reached me and I hasten to say that the action of the Académie de médecine at Paris shows clearly the lines which we should not follow. I am unwilling in any way whatsoever to become a party to such a course of action. I do not think, however, that this

> question is raised by the present issue. It is clear that it would not be feasible at the present time for Professor Klein to continue in the presidency of the Commission. After Professor Klein, Professor Smith stands out preeminently as the man who should be chosen to this office. I am willing to support him as a candidate, but I make the explicit condition that my name shall in no wise be used to support such propaganda as that of the Paris Académie above named. I am sure that Professor Smith would be the last man to lend his hand wittingly to such support. At the same time we may find ourselves entangled with men who hold such views. In that case I reserve for myself a free hand.

The possibility and efficacy of sending to the Central Committee of the International Commission the resources at the disposal of the American Subcommission had already been discussed. Osgood (in a letter to the commissioners from October 13, 1920), although on the whole supporting the idea of sending money, called for caution: "here has always been a feeling among Europeans that Americans are wealthy and that they are fair game for any one on the other side of the water who needs money. This feeling is naturally accentuated at the present time." But Osgood's letter came too late – history took a different path – and at the end of September 1920, the International Commission was dissolved. Smith wrote to the commissioners as follows on October 6, 1920:

> This is to report officially my return from Strasbourg. I had extended meetings with Fehr on September 19, 20, 21 and 22. Greenhill came for the meetings on the 21st and 22nd, and Hadamard reached there for the meeting on the 22nd. Castelnuovo did not come, and frankly stated that the Italian mathematicians would not be represented because the Congress was not International….We did not take up with Hadamard the question of the validity of the Congress, but the rest of us all felt that it was not international, and that our Commission was not justified in making any report to this Congress, or in suggesting any action which it should take. We decided to make a final report to the members of the Commission and to the countries represented. In this report there will be a statement of the work done and of the desirability for renewing the investigation after the next international congress. To this proposition we all agreed, but we all felt that the world was not yet ready to heartily enter into the further investigation along our lines. You will therefore receive from Fehr a statement to this effect, and this will go to the German representatives as well as to those of other countries.

This account pertains to the history of the whole International Commission rather than merely to its American Subcommission. It is clear, however, that the position of the American commissioners in this situation became especially important. This was even more the case after the work of the commission was renewed and Smith was elected its chair. Both the budget and the scope of the work, both in the United States and outside it, were now immeasurably more modest. Professor Reeve wrote the new study on the United States, which had been proposed by Smith, and all together 12 countries were invited to take part – in a series of letters, the commissioners discussed who should be invited and who should be crossed out from the list of invitees. For example, Smith in a letter to Osgood and Young from October 4, 1927, wrote as follows:

> It seems to me that we should keep Russia [on the list] because, in spite of the fact that we are out of sympathy with their idea of confiscation and murder, we really would like to know what, if anything, they are doing in their schema of popular mathematics. We are certainly not obliged to use anything they send unless we wish.

It even proved possible to secure funding to pay for the work of the authors of the report, which were published in the Yearbook of the National Council of Teachers of Mathematics (Reeve 1929). And nonetheless, of course, the degree of the country's involvement – as well as the world's involvement – in the research being conducted could not be compared to what it had been before the war.

10 Conclusion

The history of the American Subcommission is interesting for many reasons. First of all, the amount of work that was done is staggering. The collaboration of hundreds of mathematics educators on the writing of reports in itself was undoubtedly an important step in the development of American education. Hundreds of people thought and wrote about what American mathematics education looked like and how it might be improved. They were motivated, of course, by a desire to carry out their work as proficiently as the representatives of other countries – a motivation that was openly mentioned in the letters quoted above – but undoubtedly also by genuine concern about their country and its education. The enthusiasm and hopes of the reports' authors merit attention in their own right.

One could and should ask to what extent the work that was done was made use of subsequently. It is clear that the World War put a halt to, and likely destroyed, a great deal. The United States, perhaps more than other countries, attempted to make sense of the global experience, but these attempts, as we have seen, consisted in bringing together information from different countries in a single volume rather than in genuine analysis. From today's vantage point, the Second World War often eclipses the First. The interrupted history of the International Commission and its national subcommissions shows the degree of the war's impact even on a field as seemingly distant from it as mathematics education.

The subsequent fate of the work done by the American Subcommission, however, was influenced not only (and perhaps not primarily) by international developments, but by developments that were domestic in character. At the beginning of this chapter, we discussed different views of the development of education and four general viewpoints singled out by historians: in the materials of the commission, an interest in general questions is evident, and it would be possible to identify the four viewpoints referred to above, too. It is also possible, however, to consider the subject from a somewhat different perspective.

Above, we quoted from a report that blamed much on "ignorance and indifference on the part of educational authorities." The latter were contrasted with universities, as a leading force in the development and improvement of education. The opposite viewpoint also obviously existed in the United States. We should note the active role played by academic mathematicians in the work of the American Subcommission and the Commission's embrace of a conception of mathematics education as a whole that included both schools and universities. The observation quoted above, that "[f]or the first time in history, secondary education is truly democratic," may seem altogether contestable from today's vantage point, given the number of shortcomings – again, from today's vantage point – that may be found in schools of that time. It is hardly necessary to prove, however, that a genuine possibility to continue one's education beyond the bounds of the school is an important indicator of education's democratic character. For many of the report's authors, concern about democratic education by no means precluded, but on the contrary presupposed, concern about those who wish to continue their education at a university.

The question of centers of influence in education is connected with the question of the content and meaning of reforms in mathematics education and, more broadly, of the role of mathematics education itself and of mathematics in schools. On the whole, many of the reports quoted above can be characterized, despite their occasionally aggressive tone, as relatively restrained – Perry is not right about everything, but he appears to be right about some things. Nor should Euclid be thrown out. Problems about applications are useful and their number must be increased, but one must not by any means suppose that mathematics is about applications alone. More problems should be solved, certain courses should be reorganized, students must study geometry informally before they study it formally, various teaching methodologies must be employed (including the laboratory method), and above all teachers must know their subject better than they do. Such a program, which envisioned serious, difficult, and painstaking work, clearly had many supporters. Not by accident are certain viewpoints so often refuted in the reports quoted above: mathematics should be studied not only for the sake of immediate gain, educators must think not only about those who have no interest in mathematics, and so on; it is obvious that far from everyone agreed with the program laid out above.

The commissioners were, of course, right – changes in teaching in the country occurred slowly and with difficulty, so it should hardly be said that Smith's views were rejected and the ideas of progressive education were embraced instead; the variety of the developments taking place was too great, and undoubtedly different approaches coexisted in the future. To weigh, to "quantify" which approaches were the most influential in reality, rather than merely on paper, would be difficult, nor was this an aim of the present article. It may be confidently stated, however, that a position which differed from the commissioners' views (and which might even be described as anti-mathematical) went on to exert a great influence. Already in 1914 (letter from April 21), Tyler urged Smith to undertake "some sort of collective action in regard to protecting secondary school mathematics from the more or less destructive attacks now made upon it." Why and how these attacks took place and why they turned out in many respect to be successful deserves greater study and discussion.

The history of the work of the subcommissions examined above is also of interest because it shows how the American mathematics education community functioned. Contrary to the widespread view, cited by Osgood, that Americans were wealthy, money was precisely what was lacking. In the end, government support did materialize and prove important, but its volume cannot be compared with what was available in other countries. On the other hand, in the United States, there was support from organizations and individuals.

Undoubtedly, the commissioners' work was of the utmost importance, and above all, the work of Smith, whose astonishing energy, in conjunction with his ability to work with people and the organizations that existed at the time, was noted both by his contemporaries and later. While giving Smith his due, it must be said that he is not the only one who deserves attention: many other members of committees and subcommissions do as well. What and how did the relatively ordinary American teacher – subcommission member – think, and why did he think so? What do we know about the viewpoints of teachers who did not collaborate with the American Subcommission? To what extent did teachers share, roughly speaking, Smith's viewpoint, and how did their viewpoint change in the future (or did it not change)? All of these are questions that deserve study, and it is possible to obtain answers to them (at least partial ones).

Note that, although Smith obviously strove to involve individuals close to him in the work, it would be absolutely wrong to suppose that all authors and coauthors of reports were, so to speak, his people. This is clear not only because in the reports, as has already been noted, different viewpoints can be heard but also from the diversity of people who collaborated with the subcommission. The desire and ability to work with different people is an important trait of the American mathematics education community. It also deserves to be studied from a political and sociological perspective.

In speaking of this community and of the challenges confronting contemporary researchers of the history of American education, let us say a word in conclusion about the importance of a modern detailed critical analysis of the report prepared by the subcommission and of the state of mathematics education in the country at that time. No critical analysis of the present moment in mathematics education is possible without an understanding of the path and the direction of the path that has been traversed over the past hundred and some years. For this purpose, the national report of the American Subcommission remains a crucial document.

References

Archival sources

Smith, David Eugene. Professional papers. Rare book and manuscript library. Columbia University, New York:

Letters to and from Elmer Ellsworth Brown. Box 7.
Letters to and from Philander Priestley Claxton. Box 11.
Letters to and from William Fogg Osgood. Box 37.
Letters to and from Edson Homer Taylor. Box 51.
Letters to and from Harry Walter Tyler. Box 52.
Letters to and from Robert Simpson Woodward. Box 55.
Letters to and from Jacob William Albert Young. Box 56.

Other sources

American Commissioners. 1912. *Report of the American Commissioners of the International Commission on the Teaching of Mathematics. Bureau of Education Bulletin* 14 (1912). Washington, D.C.: Government Printing Office.

Archibald, Raymond C. 1918. *The training of teachers of mathematics for the secondary schools of the countries represented in the International commission on the teaching of mathematics, Bureau of Education Bulletin* 27 (1917). Washington, D.C.: Government Printing Office.

Broomell, Bertha Lillian. 1908. The International Commission on the teaching of mathematics – Preliminary report in outline. *The Mathematics Teacher* 1 (1): 16.

Brown, Joseph C. 1915. *Curricula in Mathematics. A Comparison of Courses in the Countries Represented in the International Commission on the Teaching of Mathematics. Bureau of Education Bulletin* 45 (1914). Washington, D.C.: Government Printing Office.

Commission Internationale de l'Enseignement Mathématique. Liste Complète des Publications du Comité Central et Sous-Commissions nationals. 1920–1921. *L'Enseignement Mathématique* 21: 319–339.

Committees III and IV. 1911. *Mathematics in the Public and Private Secondary Schools of the United States. Bureau of Education Bulletin* 16 (1911). Washington, D.C.: Government Printing Office.

Committee No. IX. 1911. *Mathematics in the Technological Schools of Collegiate Grade in the United States. Bureau of Education Bulletin* 9 (1911). Washington, D.C.: Government Printing Office.

Committee No. XII. 1912. *Graduate work in mathematics in universities and in other institutions of like grade in the United States*. *Bureau of Education Bulletin* 6 (1911). Washington, D.C.: Government Printing Office.

Committee of Ten on Secondary School Studies. 1894. *Report of the Committee of ten on secondary school studies: with the reports of the conferences arranged by the committee*. National Education Association of the United States.

Donoghue, Eileen F. 1987. *The origins of a professional mathematics education program at Teachers College. Unpublished doctoral dissertation*. Teachers College, Columbia University.

Donoghue, Eileen F. 2003. The emergence of a profession: Mathematics education in the United States, 1890–1920. In *A History of School Mathematics*, ed. George Stanic and Jeremy Kilpatrick, 159–194. Reston, VA: National Council of Teachers of Mathematics.

International commission on the teaching of mathematics. 1909. *School Science and Mathematics* 9(5): 489.

Jones, Phillip S., Arthur F. Coxford Jr., (eds). 1970. *A History of Mathematics Education in the United States and Canada.* National Council of Teachers of Mathematics Thirty-Second Yearbook. Washington, D.C.: National Council of Teachers of Mathematics.

Kandel, Isaac Leon. 1915. *The Training of Elementary School Teachers in Mathematics in the Countries Represented in the International Commission on the Teaching of Mathematics. Bureau of Education Bulletin* 39 (1915). Washington, D.C.: Government Printing Office.

Karpinski, Louis Charles. 1909a. Note of the translator. *School Science and Mathematics* 9(2): 113.

Karpinski, Louis Charles. 1909b. The Program of the International Commission on the Teaching of Mathematics*. Science, New Series* 29(746): 605–606.

Karpinski, Louis Charles. 1909c. Reform in the Teaching of Mathematics. *The School Review* 17(4): 267–271.

Kliebard, Herbert M. 1981. *Education at the turn of the century. A crucible for curriculum change*. Division B invited address presented at the annual meeting of the American Educational Research Association. Los Angeles.

List of publications of the Central Committee and the National Sub-Commissions. 1913. *School Science and Mathematics* 13(8): 713–725.

Notes and News. 1915. *The Mathematics Teacher* 8(2): 108–112.

Parshall, Karen Hunger. 2003. Historical contours of the American mathematical research community. In *A History of School Mathematics*, ed. George Stanic and Jeremy Kilpatrick, 113–158. Reston, VA: National Council of Teachers of Mathematics.

Preliminary Report of the American Commissioners. 1909, *School Science and Mathematics* 9(6): 603–608.

Preliminary Report of the International Commission on Secondary Mathematics. 1909. *School Science and Mathematics* 9(2): 101–113.

Reeve, William D. (Ed.). 1929. Significant changes and trends in the teaching of mathematics throughout the world since 1910. New York, NY: Teachers College, Columbia University.

Reports of the American Commissioners. 1912. *School Science and Mathematics* 12(1): 75.

Roberts, David L. 1997. *Mathematics and Pedagogy: Professional Mathematicians and American Educational Reform, 1893-1923*. *Unpublished doctoral dissertation*. Johns Hopkins University.

Second Preliminary Report of the American Commissioners. 1909. *School Science and Mathematics* 9(8): 777–787.

Smith, David Eugene. 1900. *The teaching of elementary mathematics.* New York: The Macmillan Company.

Smith, David Eugene. 1909a. The teaching of mathematics in the secondary schools of the United States. *School Science and Mathematics* 9(3): 203–219.

Smith, David Eugene. 1909b. The American work of the International Commission on the teaching of mathematics. *The Mathematics Teacher* 2(2): 56–71.

Smith, David Eugene. 1910. The International Commission on the teaching of mathematics. *The American Mathematical Monthly* 17(1): 1–8.

Smith, David Eugene, and Charles Goldziher. 1912. Bibliography of the Teaching of Mathematics 1900-1912. *Bureau of Education Bulletin* 503 (1912). Washington, D.C.: Government Printing Office.

Smith, David Eugene and Caroline Eustis Seely. 1918. Union List of Mathematical Periodicals. *Bureau of Education Bulletin* 9 (1918). Washington, D.C.: Government Printing Office.

Stanic, George M. A. 1986. The Growing Crisis in Mathematics Education in the Early Twentieth Century. *Journal for Research in Mathematics Education* 17: 190–205.

Stanic, George M. A. 1987. Mathematics Education in the United States at the Beginning of the Twentieth Century. In *The Formation of School Subjects*, ed. Thomas S. Popkewitz, 145–175. New York: Falmer.

Taylor, Edson Homer. 1915. *Mathematics in the Lower and Middle Commercial and Industrial Schools of Various Countries Represented in the International Commission on the Teaching of Mathematics*. *Bureau of Education Bulletin* 35 (1915). Washington, D.C.: Government Printing Office.

The American Federation of Teachers of the Mathematical and the Natural Sciences. 1907, *School Science and Mathematics* 7(3): 242–243.

The International Commission on the Teaching of Mathematics, Session at Milan. 1912, *School Science and Mathematics* 12(2): 159.

Yasin, Said Taha. 1961. *The reform movement in secondary mathematics – its history and present state. Unpublished doctoral dissertation*. Indiana University.

Young, Jacob William Albert. 1907. *The Teaching of mathematics in the elementary and secondary school.* New York: Longmans, Green & Co.

Young, Jacob William Albert. 1910. International commission. *School Science and Mathematics* 10(4): 341–342.

Young, Jacob William Albert. 1912. The Fifth International Congress of Mathematicians. *The American Mathematical Monthly* 19(10/11): 161–166.

Young, Jacob William Albert. 1914. International commission. *School Science and Mathematics* 14(2): 185.

Young, Jacob William Albert and David Eugene Smith. 1916. The Training of Teachers of Mathematics in United States of America. *L'Enseignement Mathématique* 18: 429–439.

Author Index

A. Karp (ed.), *National Subcommissions of ICMI and their Role in the Reform of Mathematics Education*, International Studies in the History of Mathematics and its Teaching, https://doi.org/10.1007/978-3-030-14865-2

Subject Index

A. Karp (ed.), *National Subcommissions of ICMI and their Role in the Reform of Mathematics Education*, International Studies in the History of Mathematics and its Teaching, https://doi.org/10.1007/978-3-030-14865-2