"Lions – Marchuk": The Soviet-French Cooperation in Computing

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Abstract. This paper looks to break with common assumptions of the underdevelopment and isolation of the Soviet computing by studying the history of the Soviet-French cooperation in computer science under the bilateral agreement of 1966. The achievements of this cooperation were largely due to the singular relations between French and Soviet mathematicians, J-L Lions and G. I. Marchuk. Although neither Marchuk nor Lions are computer scientists, properly speaking, they played crucial roles in promoting the use of computers as scientific instruments and in creating the administrative basis for the development of computer science. This work aims to present a trans-national history of computing and the networks, which existed between Soviet and Western computer scientists at the nexus of science and politics.

Keywords: Computers, Soviet Union, France, Cold War.

I have no doubt that communication is the principal way to understand the processes underlying the development of modern science.
G.I. Marchuk *Vstrechi i Razmyshleniia* (Moskva: Nauka, 1995), p. 9

1 Introduction

Two common assumptions dominate the perception of the history of Soviet computing: Soviet computers were few and not very good; levels of secrecy were extremely high, causing isolation from the international community.[1] This paper demonstrates that although these notions are not entirely incorrect, there is a case demonstrating that the development of Soviet computer science was on par with the international level, and that East-West cooperation in computing did exist. The case under investigation is the so-called "Lions-Marchuk" collaboration under the umbrella of the Soviet-French bilateral agreement of 1966. I attempt to answer the question: How did such cooperation become possible politically, institutionally and scientifically?

[1] Many studies are preoccupied by the question of technological independency, for example see: G. D. Crowe and S. E. Goodman, "S. A. Lebedev and the Birth of Soviet computing," *IEEE Annals of the History of Computing*, Vol. 16 (1994), no. 1: 4-24; and A. Fitzpatrick, T. Kazakova, and S. Berkovich, "MESM and the Beginning of the Computer Era in the Soviet Union," *IEEE Annals of the History of Computing*, Vol. 28 (2006), no. 3: 4-17.

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The three parts of the paper articulate the beginnings of Soviet-French cooperation in the following order. First, I introduce a vertical framework for the Lions-Marchuk relation, which is the Soviet-French Bilateral Agreement in Science and Technology. I argue that the agreement should be read in the context of the pivotal role that science and technology played in transatlantic hegemonic relations. In the second part, I examine the horizontal level of cooperation: How did the peculiarities of the development of computer technology and science in France and the USSR create the institutional bases and motivations for cooperation in computing? Finally, I study the realities of the so-called "Lions-Marchuk" cooperation.

2 *«Détente, entente et coopération»*

In March 1966, France left the leadership of the NATO, and, three months later, General de Gaulle undertook a triumphant official visit to the Soviet Union. This visit was, no doubt, a great event for the Soviet diplomacy. From the 20th to the 28th of June de Gaulle visited Moscow State University, Novosibirsk and its Akademgorodok, Leningrad, Kiev and Volgograd. The results of the visit are still a historical controversy. Some diplomatic historians assert that Soviets were left almost empty-handed: an invitation to visit Paris and a couple of scientific exchange agreements. The main issue of the day, the so-called "German Question," was left without any resolution. [1, 2] For some others, the French-Soviet Agreement signed on the 30th of June 1966 marked the French-Soviet *détente* and served as a model for the subsequent relations between the Soviet Union and Western countries. [13]

I believe that the scientific agreements between France and the USSR should be read in the context of John Krige's conclusion that basic science was the key node articulating American hegemony with the post-war reconstruction of science in Europe. [9] The French pursuit of nuclear capacity is the best-known element of the European resistance to American scientific and technological leadership. According to French technocrats the wartime defeat was to be overcome through technological development; the future of the French nation was at stake. [6] In this light, the agreements of the 30th June were more than a gesture and should be inscribed in a longer political movement of establishing French science and technology as independent from United States' influence.[2]

Whereas *informatique*, the French term for computer science, became international, early French computing history is sometimes told as a "history of technology transfer."[3] In fact, the French name for computer – *ordinateur*, – was invented in 1955 to better promote IBM machines on the French market. Furthermore, in 1964, the General was faced with a somewhat unanticipated set of problems. Bull, the only French company that specialized in computers for management, lost its majority holdings and became dominated by the American General Electrics

[2] For an earlier example of such a movement, see how the USSR adapted the French standard for its television: Walter Kaiser, "The PAL-SECAM Color Television Controversy," *History of Technology,* vol. 20 (1998), no.1: 1-16.

[3] Pierre Mounier-Kuhn, "History of computing in France," *IEEE Annals of the History of Computing*, vol. 11 (1989), no. 4: 237-240, p. 237. The whole volume is dedicated to the history of computing in France.

Company. France had an effective nuclear force de frappe, the ultimate demonstration of the triumph of De Gaulle's independent line; yet the failure to retain a native computing industry was significant. When in 1966 the USA put an embargo for a delivery of a big scientific computer (CDC 6600) ordered by France for its "bombe H" calculations, it triggered important governmental interventions in the affairs of French computing industry and science.

In the second half of 1960s, the new ambition of the French government was to challenge the American domination of the French computing market. The special inter-ministry commission created in 1965 rated informatics of "equal importance to atomic energy, civil aviation, and space."[4] On July 19th, 1966 General de Gaulle signed the "*Plan Calcul*" which prompted the creation of a new private computer company and a public research institute: CII (*Compagnie Internationale pour l'Informatique*) and INRIA (*Institut National de Recherche en Informatique et Automatique*). Symbolically, the newly created INRIA was attributed the location in Rocquencourt, a NATO military camp recently liberated from its occupants. Researches moved into the military caserns.

Within the Soviet Union the situation in the field of computing was rather complicated: a great deal of secrecy and contention split Soviet computing between the military and academia. [7, 12] The military benefited from a better material supply; meanwhile academia counter-balanced its scare resources with a relative openness. In October 1955, the existence of Soviet computers was revealed to the world at the now famous Darmstadt Conference, prior to being officially declassified for the Soviet Union's own citizens.[5] After this date there were rare visits and contacts between Soviet and Western computer scientists under the inter-academies exchange agreements and under the auspices of the International Federation for Information Processing (IFIP). [3] High level scholars connected with computing, such as academician Dorodnitsyn, were looking for every possibility of international contacts, and advanced the following reasons when arguing at the governmental level: to access easy sources for information collection; but also to prevent negative propaganda of the USSR's technological underdevelopment, provoked by insufficient demonstration of the Soviet achievements in computing.[6]

When in 1966 the French-Soviet Agreement provided a rare opportunity for cooperation, it was able to satisfy several Soviet interests: to grant the Soviets information on the French "state of the art" in computing, but also to provide a platform to access American know-how, since Americans were dominating the

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[4] Henri Boucher, "Informatics in the Defense Industry," *IEEE Annals of the History of Computing*, Vol. 12 (1990), no. 4: 227-240, p. 238.

[5] Unfortunately, the history of the Darmstadt is relatively understudied, see: Slava Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics*, (Cambridge, Mass.: MIT Press, 2002), pp. 155-58; Herman Goldstine, *The Compute from Pascal to von Neumann* (Princeton, NJ: Princeton University Press, 1972), pp. 349-62. For published sources see: "Darmstadt Conference Proceedings," *Nachrichtentechnische Fachberichte* (Braunschweig), vol. 4 (1956), no. 1; and Alston Housholder, "Digital Computers in Eastern Europe," *Computers and Automation*, no. 12:4 (1955), p. 8.

[6] A. A. Dorodnitsyn, "Justification of the USSR AS need to join IFIP", October 9, 1959 in Ershov Archive, see:
http://ershov.iis.nsk.su/archive/eaimage.asp?lang=2&did=28&fileid=78246

French market and French researchers had extensive connections with American scientists. Ironically, Akademgorodok, a center situated far away from Soviet Western frontiers, became the main beneficiary of this new possibility for cooperation. In 1958, academicians Lavrentiev, Sobolev and Khristianovitch acquired the support and funds from the Khrushchev government for the construction of a Siberian city of science. Designed as an alternative to the secret research centers working for the military (the infamous "boxes"), the new Akademgorodok was created to stimulate Siberian civil research, its connections with industry, and the exploitation of Siberian natural resources. Using his position at the head of a newly created Siberian branch of the Academy of Sciences and personal connections at the "top," Lavrentiev promised young talented researchers fast promotions and some cold but free air far from Moscow's sight. [8] These conditions rapidly made the scientific town an international center of great fame.

The context unfolded here can explain French and Soviet official willingness to cooperate in the field of computer science, endowing the agreement with some real content of "mutual interest." The international treaties that followed the visit of General de Gaulle to the USSR in 1966 provided the administrative and financial framework for cooperation. Cooperation between Soviet and French computer scientists functioned and developed according to these structures throughout the following decades up until 1993.

3 Akademgorodok CC – INRIA

INRIA, as a pilot institution for computer science, was responsible for Soviet-French cooperation in this field and represented France in all negotiations at the level of the working group in computing. Institutes specialized in computing under the auspices of the Academy of Sciences participated on the Soviet side. The Akademgorodok Computing Center (CC) became the main interlocutor of INRIA due to a constellation of circumstances: the official civilian character of the research done in Akademgorodok, the important role of computers as scientific tools for Akademgorodok sciences, and the human factor. Academicians Sobolev and Lavrentiev are known for their personal involvement with the early development of Soviet computing; unsurprisingly, they launched an initiative for the creation of a special CC in Akademgorodok.[7] Lavrentiev personally invited a young applied mathematician, Guriy Marchuk, to direct it. In 1964, the CC became independent from Sobolev's Institute of Mathematics and existed until the troubled times of nineties, when it was divided into several institutes.

The best account on the early history of Soviet computing under the umbrella of cybernetics is *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* by Slava Gerovitch. The focus of the book is the complex relation between Soviet science and politics, which was responsible for the checkered nature and destiny of Soviet cybernetics. [5] Akademgorodok became home for Alexey Liapunov and

[7] Notes on the conversation about the history of Soviet Computing with M. A. Lavrentiev by A. P. Ershov in Ershov Archve, see: http://ershov.iis.nsk.su/archive/eaindex.asp?pplid=799&did=17909

Sergei Sobolev, two of three authors of the famous article-manifesto "Essential Characteristics of Cybernetics" [Osnovye cherty kibernetiki], which appeared in *Questions of Philosophy* [*Voprosy Filosofii*] in 1955 and marked a turning point in favor of cybernetics, previously publicly abused as pseudo-science. [14] Moreover, some new generation computer scientists, like Andrey Ershov, a talented pupil of Liapunov, gathered in Siberia at the very moment when Soviet cybernetics was gaining in power. Located at the periphery of the cybernetic movement, these scientists were involved with a different kind of computing, distinct from the interdisciplinary cybernetics. According to my interpretation the young Akademgorodok CC (newly created and staffed with a very young team) was implementing the principle "enough philosophy, lets get to work," and was intentionally seeking international contacts in order to build its reputation on a national scale. The quest for machines, budgets, buildings, and human resources was closely connected to the issues of scientific authority and fame.

The conditions in which the French INRIA had found itself were not entirely dissimilar. French scholars labeled the early period of INRIA's existence as "badly guided" – "*Institut malmené*."[8] The challenges left to the young institute by the government, research for the French industry and education, were very difficult to realize in the conditions of insufficient and unqualified personnel, lack of machines, and a constant threat of decentralization. In addition, the heterogeneous administration constantly fought over the distribution of the tight budget. In order to assert its own identity, INRIA sought partners at home and abroad.

The first reports published by INRIA underlined its success in developing international connections. INRIA was responsible for education in computer science and distributed international fellowships, which helped a lot to establish initial contacts with the most prominent centers in the United States.[9] These first reports also revealed the role of INRIA in Soviet-French cooperation. The first president of the institute, Michel Laudet, traveled to Moscow to participate in French-Soviet working groups and set up the procedures for exchanges.[10] However, most interesting for us are the summary descriptions of the cooperation between the department of numerical computing directed by Lions and the Akademgorodok CC, directed by Marchuk. This line of collaboration became nicknamed "Lions-Marchuk cooperation," reflecting the importance of the personal relationship between the two scientists.

4 Lions – Marchuk Cooperation

In Marchuk's published memoirs, an almost legendary story tells us that, during his visit to Akademgorodok, General de Gaulle personally delivered J-L Lions' invitation to Marchuk to visit his laboratory in Paris.[11] The invitation in question was more likely made by Gaston Palewski, the Minister of Science and Technology from 1962

[8] Alain Beltran and Pascal Griset, *Histoire d'un pionnier de l'informatique* (Paris: EDP Sciences, coll. Sciences & Histoire, 2007), p. 17.

[9] *Rapport d'Activité de l'IRIA*, 1972, p. 73.

[10] *Rapport d'Activité de l'IRIA*, 1970, p. 59.

[11] G. I. Marchuk, O. N. Marchuk, *Neizvestnye stranitzy iz zhizni nekotorykh uchionykh* (Moskva: Nauka, 2002), pp. 137-38.

to 1965, during a different visit to Akademgorodok. However, the metamorphosis captured in the memoirs (published in 2002) transforms the Marchuk of 1966 into a hero with a historical mission and underlines the important political aspect of the beginning of the Lions-Marchuk cooperation.

Documents show that at first Marchuk visited Lions at the Institut de Blaise Pascal, part of the Sorbonne, in 1966. Soon Lions became the director of the department of Numerical Informatics, later renamed *Laboria*, the research unit at the heart of INRIA. Surrounded by the talented young people, so-called "*lionceaux*" ("lions' cubs" in French), Lions succeed in developing a powerful school of applied mathematics, and expanded considerably its field of operations. [4] I was told by Alain Bensoussan, one of the "*lionceaux*" who replaced Lions as head of INRIA, that long before any official cooperation Lions was particularly interested in Siberian splitting up methods and encouraged Bensoussan to employ them in his PhD research.[12] Marchuk also recalls being surprised by Lions' deep knowledge of his works; Lions read scientific Russian but couldn't speak it.[13] Apparently linguistic issues did not cause any trouble to establishment of mutual sympathy based on the commonality of research interests, but also on several less tangible factors, such as the tradition of collaboration between Russian and French mathematicians and common traits in personalities.

It is important to highlight that the collaboration worked out not only for Lions and Marchuk themselves: in fact, they also made their teams cooperate. The INRIA reports describe three principal themes of cooperation: 1) Techniques of decomposition, decentralization and parallelization (cooperation on the splitting up methods by N. Yanenko and R. Temam); 2) Identification of systems; 3) Optimization.[14] In brief, almost all of the most influential "*lionceaux*" participated in collaborations with Soviet scientists from Novosibirsk. Important personal links on the lower levels of the network were formed.[15] Such cooperation involved making their students work on adjacent topics and sharing their results. It was cumbersome to organize a long visit for a student or researcher, because of a difficult bureaucratic procedure, the request for a place from the so-called "long-stay" quotas. However, the government sponsored the short-term visits and annual meetings. From the end of the 1960s and during the 1970s, short visits were routine, and the so-called "Lions-Marchuk" colloquium took place every year, alternating between Akademgorodok and Paris. The main visible results of these meetings were publications, such as the following volumes: *Sur les méthodes numériques en sciences physiques et économiques*; *Étude numériques des Grandes systèmes*. [10, 11] The contents of these collections reflect 1970s tendencies within numerical analysis. The main topics of research were: principles of organization of

[12] Alain Benssoussan, personal communication to the author.

[13] Guriy Marchuk, personal communication to the author.

[14] *Rapport d'activité de l'INRIA*, 1969, p. 51.

[15] One of the favored examples of INRIA staff is a romantic story between a French researcher from INRIA, A. Morocco, and an interpreter from Akademgorodok. The love story grew into the marriage, witnessed by numerous documents in INRIA Archives. Morocco and his wife asked for research travel to Akademgorodok. Here is one quote from the correspondence between Lions and Marchuk: "…you already know him. He would go with his wife, who is from Novosibirsk (the best example of collaboration!!!)" January 10, 1978, INRIA Archives, box 83.06.035.

software systems for the resolution of partial differential equations by finite elements; modeling and optimization of complex systems; and technical aspects of implementation of methods of approximation using supercomputers.

One important factor that both Lions and Marchuk had to deal with was the well-known problem of the lack of machines. They were interested in developing numerical techniques allowing optimization of machine power. INRIA and Akademgorodok CC researchers had to proceed with a different philosophy compared to the American approach when resolving scientific problems. There is a direct statement disclosing these differences of practices in Lions' letter to Harold Agnew, director of the Los Alamos Laboratory from 1970 to 1979. Lions explains: "We have to work in advantage on the models and mathematical aspects before going to the computer. From this point of view (and only from this one!) we work more like the Russians."[16] The oral history interviews I conducted with Lions' collaborators transmitted a very similar message, but without the parenthetical note.[17] Two schools of numerical analysis, the French and the Siberian, had at least two characteristics in common: they had "to think more" (than Americans) and they relied heavily on personal networks, structured around the father figures of the school-founders.

Although neither Marchuk nor Lions are computer scientists, properly speaking, they played crucial roles in promoting the use of computers as scientific instruments and in creating the administrative basis for the development of computer science. Both Lions and Marchuk were sought-after and successful advisers, keeping links with their former students and actively helping them to acquire positions, so that the "Lions-Marchuk cooperation" acquired the character of "networks in cooperation." Both Lions and Marchuk not only frequently crossed national frontiers, but also circulated with ease in the different spheres: science, politics and industry. From the middle of the 1970's and during the following years the careers of these two men underwent a dramatic rise. They became powerful administrators of the "big science" at the highest levels.[18] A consequence was a change in the nature of their involvement in cooperation matters.

5 Conclusion

We saw that for the cooperation between the French and Soviet computer scientists to exist, an accumulation of political, institutional, and personal willpower and interest was indispensable. The French government wanted to cooperate in order to build up a computer industry and research independently of American efforts. The Soviets were trying to access the Western computing world. Both INRIA and Akademgorodok CC were young institutions and used international contacts to create their own identity and to establish their authority within the national context. Finally, Lions and Marchuk were the human engines of the cooperation. They used the political agenda

[16] J-L Lions to Harold Agnew, letter quoted in Dahan-Dalmedico, *Jacques-Louis Lions*, pp. 183-84.

[17] George Nissen, personal communication to the author.

[18] Marchuk is best known as the last president of the Soviet Academy of Sciences and Lions left INRIA to preside over the French national center for space studies (CNES).

to realize their scientific and career ambitions, generating transnational links at the different levels of their personal networks.

The Lions-Marchuk cooperation demonstrates that Soviet –West cooperation in computing did exist under certain political circumstances, and that the well-known Soviet shortage of machine power contributed to the development of numerical techniques of great interest to Western researchers. Finally, this paper reveals the potential promise of looking beyond the Soviet-American antagonism.

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References

1. Bariéty, J.: Le voyage de de Gaulle à Moscou en 1966 et la question allemande (D'après les documents des Archives de ministère français des Affaires Etrangères). In: Rossiia i Frantziia, XVIII-XX veka. vypusk, vol. 4, pp. 282–289. Nauka, Moskva (2001)
2. Belousova, Z.S.: K vizitu generala de Gollia v Sovetskiy Soiuz v 1966 godu (Na osnove arkhivov Ministerstva Mezhdunarodnykh Del Rossii). In: Rossiia i Frantziia, XVIII-XX veka. vypusk, vol. 4, p. 290–295. Nauka, Moskva (2001)
3. Carr III, J.W., Perlis, A.J., Robertson, J.E., Scott, N.R.: A Visit to the Computation Centers in the Soviet Union. Communications of ACM 2(6), 8–20 (1959)
4. Dahan-Dalmedico, A.: Jaques-Louis Lions, un mathématicien d'exception entre recherche industrie et politique. La Découverte, Paris (2005)
5. Gerovitch, S.: From Newspeak to Cyberspeak. MIT Press, Cambridge (2002)
6. Hecht, G.: The Radiance of Franc: Nuclear Power and National Identity after World War II. MIT Press, Cambridge (1998)
7. Ichikawa, H.: Strela-1, the First Soviet Computer: Political Success and Technological Failure. IEEE Annals of the History of Computing 28(3), 18–31 (2006)
8. Josephson, P.: New Atlantis Revisited: Akademgorodok, the Siberian City of Science. Princeton University Press, Princeton (1997)
9. Krige, J.: American Hegemony and the Postwar Reconstruction of Science in Europe. MIT Press, Cambridge (2006)
10. Lions, J.L., Marchouk, G.I. (eds.): Méthodes Mathématique de l'Informatique – 4, Sur les méthodes numérique en sciences physiques et économiques, Paris (1977)
11. Lions, J.L., Marchouk, G.I. (eds.): Méthodes Mathématique de l'Informatique – 7, Etude numérique des grands systèmes, Paris (1978)
12. Malinovskii, B.N.: Istoriia vycheslitel'noi tekhniki v litzakh. Naukova Dumka, Kiev (1995)
13. Rey, M.P.: La Tentation du rapprochement: France et URSS à l'heure de la détente, 1964-1974. Publications de la Sorbonne, Paris (1991)
14. Sobolev, S.L., Kitov, A.I., Liapunov, A.A.: Osnovnue cherty kibernetiki. Voprosy filosofii (4), 136–148 (1955)