On the Development of Computer Science among Mathematicians[1]

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ABSTRACT: The development of computer science in the contemporary sense at the University of Belgrade, and especially among Belgrade mathematicians, is firmly connected to the procurement of the first reliable computer system in 1968 at the University, the IBM 360/44 system, as well as the conception of the development of programming as conceived by professor Nedeljko Parezanović. This paper outlines the events that led to establishing computer science as an independent discipline in Serbia.

KEYWORDS: computer science, programming, computer network, computer terminology, Nedeljko Parezanović

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Vitas Duško
vitas@matf.bg.ac.rs
University of Belgrade
Faculty of Mathematics
Serbia

1 Introduction

This year marks half a century of the first, significant installation of the computer system from the IBM 360 series at the University of Belgrade. It is, therefore, an appropriate occasion to give an account of how the qualities of this machine, and even more the people engaged with it, influenced the development of computer science among Serbian mathematicians, and in Serbia in general. To the extent to which our feeble memory and preserved documents allow us, we will attempt to demonstrate how this computer – once incorporated into a well-conceived development concept – set long-term trajectories of the development of Serbian computer science and its

[1] This text is a written version of my address regarding the development of computer science at the Faculty of Mathematics given at the occasion of the first Nedeljko Parezanović award for most successful computer science students in November 2017.

applications. As many later procurements of computer equipment show, it is obvious that it is far more important to conceive a notion for using computer equipment than obtaining it,[2] but also that not even this is sufficient for overcoming inner resistance to modernization.

The paper focuses on the role of this system among Belgrade mathematicians. The acknowledgement of programming skills as a "discipline of mathematical nature" (Dijkstra, 1974) by traditional mathematics paved the way for extending the scope of the application of mathematical methods beyond the established borders, introducing a "practical" component to mathematical work. The temptation to enter a new, unknown, interdisciplinary area was overcome slowly and with difficulty, of which there are traces even today. However, numerous successful introductions of computers in science, culture, and economy, are rooted in activities started in these circumstances and on this machine.

Half a century later, it is hard to imagine the problems that the process of introducing computers had faced at its very beginning. Let us just mention the issue of translating concepts of a (at the time) new discipline from English to Serbo-Croatian. Even the basic concepts like *computer*, *file*, *store* and *storage* do not have their stable equivalents in the Serbian language. *Computer*, for example, has the equivalents *kompjuter* and *računar*,[3] and both of these terms have generated their own derivational paradigms which are not in concordance with each other. Among the particularly interesting derivates we find, besides the term *informatika*, terms like: *računarstvo*, *računarske nauke*, *kompjuterske nauke*, *kompjuteristika*, which are almost always a substitute for the English term *computer science*. The confusion caused by such an unstable terminology is illustrated by the syntagma "computer science and informatics" (*računarstvo i informatika*) (or in the reversed order),[4] which does not have an adequate equivalent in the English language.

[2] Early attempts to develop a national, Yugloslav, computer, primarily focused on developing machines of the CER type at the Vinča Institute and the Mihailo Pupin Institute for, apparently, mostly military purposes, will not be discussed in this paper.

[3] We find both terms in the first, national glossary of computer science terms (Kontić, 1974), next to descriptions *device for processing data* and *electronic computational device*.

[4] For example, the Faculty of Mathematics at the University of Belgrade has the department Computer Science and Informatics, while the Singidunum University has Informatics and Computer Science, with essentially different content!

2 Vague Beginnings

Prior to the installation of the IBM 360 machine at the beginning of the 1960s, the Mathematical Institute procured an Elliott 803B *electronic computing machine*,[5] which was placed at the Faculty of Science and Mathematics in Simina Street 2. The information about this computer is obscure, and can be found in (Simonović and Krunić, 1964), where the preface states the following motive for procuring it: "Although application of electronic computing machines is spreading ever faster in our country, there are few publications in our native language that deal with programming systems for individual computing machines, or programming in general." This claim is affirmed by the shared catalogue of Serbian libraries, where one can find that there were only a few titles in Serbian libraries until 1968 that contained the keyword "programming" – mostly manuals for machines by the manufacturer UNIVAC.

The authors further write that Elliott belongs to a class of medium-size computers with a ferrite core memory in 4,096 words of 39-bit length. It can perform 1,150 add operations per second, and 220 multiply operations per second. It has input and output on a 5-track punched tape. The tape is read at 500 characters per second, and punched (as an output device) at 100 characters per second. Another option for input and output is a magnetic tape.

Figure 1. The look of the Elliot 803B machine, according to (Simonović and Krunić, 1964).

[5] Elliott 803 (on-line)

It used the programming language Autocad III, with a set of instructions for integer and real arithmetic. What is interesting is that real numbers in the so-called floating-point notation[6] are referred to as rational numbers in this manual, which is a far more precise term with regard to their nature that the later, accepted term.

At approximately the same time, Christian Anthony Richard Hoare began his career as a programmer while working on this machine, developing his famous algorithm for sorting "quicksort", as well as implementing the language Algol 60 (Hoare, 1980).

In Yugoslavia at the time, the most significant conference that gathered researchers from fields close to computer science was ETAN (short for Electronics, Telecommunications, Automatics, Nuclear technology). By reading the collection of works from the conference in 1968,[7] one can notice that the bursting development of computer science methods and devices had hardly any influence on research "at home" at the time. Among the rare "programming" papers is (Ракић, 1968), which discusses the possibility of teaching programming in the country. He notes that the Faculty of Electrical Engineering has two optional course, Computing machines and Programming, each with three classes a week per semester.[8] There is no information regarding the content of these courses. It is evident from his account that during that period, in Serbian academic circles, computer science was still not acknowledged as a discipline with foundations in mathematics and electronics, as well as a need for its own development.[9] An account of the national development of computer technology can be found in (Lazić, 2006).

[6] Real numbers are always expressed in computer memory by a finite number of binary digits, making the set of the expressed "real" numbers finite.

[7] ETAN 1968 (on-line)

[8] Teaching programming at the Department of Mathematics at the Faculty for Science and Mathematics began in 1961, but students did not have access to computers.

[9] One should mention that, beginning in 1965, a regular annual conference *Informatica* was held on the lake Bled, organized by the Federal Board for Data Processing as part of ETAN, and later the Slovenian association Informatika, with predominantly computer science topics.

3 IBM 360/44

In our opinion, the crucial step for the development of programming, as a key computer science discipline, was the installation of the IBM 360/44 system at the University of Belgrade in 1968.

IBM launched the machine series 360 in 1964, clearing the way, as it is commonly accepted, for a wide use of computers in both science and commerce,[10] due to its reliability and the compatibility of different computer models from this series. The model 44 is a special type of high-performance machine designed exclusively for scientific calculation. Bringing this modern machine with high performances (for the time) into a scientific environment paved the way for a valuable interaction between (primarily) mathematicians, but also other researchers from natural sciences, with the latest computer science technology.

When the machine was installed, it was, so it seemed, such huge news that there is an anecdote from that time, which says that some newspapers reported that the Faculty of Science and Mathematics installed a computer with a central *pro**f**essor* and *card **cl**ea**n**er*: the terms *processor* and *reader* (meaning a device) were completely unknown to a broader audience.

There is little information regarding how this machine was purchased. According to (Vujičić i Čavčić, 1972), the equipment was purchased with funds given by the Federal and Republic Association for Scientific Research, but there is no reliable information regarding the amount of these funds. The computer's initial configuration had an internal memory of 64Kb and two removable IBM 2315 disk cartridges with a capacity of 1Mb.[11] It had a card reader for input, and a printer or card punch for output. Later, in 1972, the internal memory was doubled to 128Kb, and two additional removable IMB 2311 disk packs were added, each with a capacity of 7.25Kb.

At the beginning, the only software available for this computer was a compiler for FORTRAN IV (Parezanović, 1970), apart from the assembler and modest utility programs of the time. This sort of system support was appropriate for the needs of intensive computation required by methods of numerical mathematics, but also of other natural sciences. Given the already-mentioned hardware expansion, the machine's possibilities were advanced

[10] IBM 360 (on-line)

[11] Today, this computer can be seen in the Museum of Science and Technology, in the Collection of Computers and Information technology, and the image of the central unit can be found at IBM3 60/44 from the Institute of Mathematics (on-line)

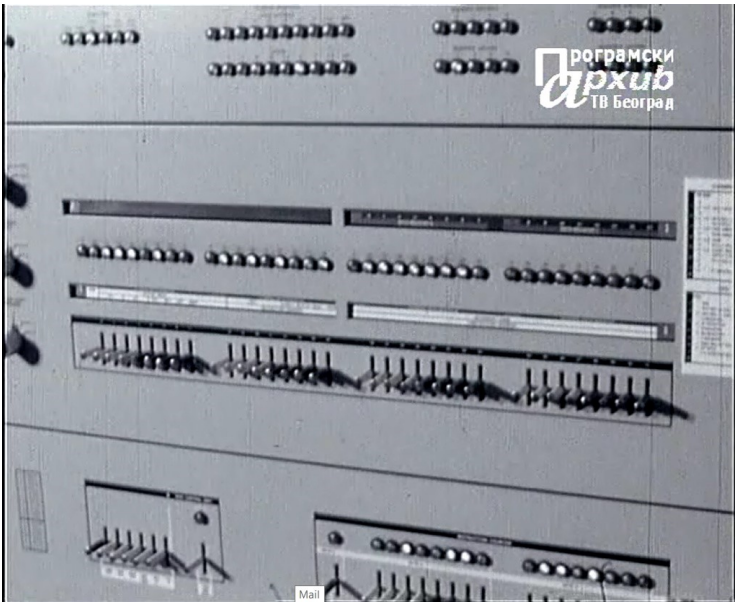

Figure 2. The IBM 360/44 control board (image taken from the Archive of Television Belgrade, on the occasion of the opening of the Centre).

due to the installation of a newer version of an operating system, and the procurement of the compiler for COBOL and PL/I languages for the needs of commercial application.

This computer equipment was entrusted to the Mathematical Institute of the Serbian Academy of Sciences and Art (SASA), and the premises was provided by the former Faculty of Science and Mathematics (PMF). A special unit was formed within the Institute – the Computer Centre, which employed several mathematicians and utility staff (operators working on the system and card punch), while the head of the Centre was professor Nedeljko Parezanović.[12] It was planned that the staff would during one part of their workday engage in commercial projects for the needs of the industry. During the other part, the Centre's associates were supposed to partake in lectures and research work in the field of computer science. This concept enabled

[12] For more details about the activities of professor Parezanović, see: Infoteka 9 (1-2), May 2008. Infotheca 2008 dedicated to Prof. Nedeljko Parezanović (on-line)

them to provide necessary means for maintaining the machine, but also to fulfill the needs of teaching programming at PMF.

The scientific research conducted by the Centre's associates, according to (Vujičić i Čavčić, 1972), occurred in two main fields:

– "theory of programming, which included the theory of algorithms, theory of formal languages, programming systems with an emphasis on operating systems and translation theory,
– numerical analysis with an accent on applying numerical methods on computers, especially numerical procedures in problems of optimization."

This machine made possible practical exercises for students of mathematics at the department for Numerical mathematics with cybernetics, and during its first year of activity numerous university, research and commercial organizations started to use it for their work, including the Water Management Institute, Mining Institute, Institute of Physics, and others. By 1972, over 70 scientific and commercial organizations used the services of this Computer Centre regularly or periodically. At the same time, this machine laid the foundation for the development of the application of computers in physics, chemistry, astrophysics and other natural sciences. It is interesting to mention that this machine was also used for the production of works of contemporary art (see Figure 3).

The first of the above-mentioned research fields embraced programming as the primary task of the Centre's associates, with research focus on major programming disciplines. This course cleared the way for research aiming to examine programming problems as such, with no immediate use in mind. Among the first programming projects of this kind was the development of the system METASS, a pre-processor for FORTRAN developed by Dušan Bratičević and later described in his master's thesis (Bratićević, 1978). The list of "programming" master's thesis under the mentorship of professor Parezanović can be found in (Настић, 2008).

4 Seminary

In the same year, 1968, when the first IBM 360/44 system was purchased in Belgrade, the world was witnessing the developing response to the first software crisis: a problem which emerged as a result of inadequate software tools for controlling the increasingly complex software products. During this period, several publications came out: on the one hand, the first of Knuth's

Figure 3. Visual poem 1970, collage on cardboard 71×50 cm, Miroljub Todorivić (Skopje, 1940) (from the permanent exhibition of the Museum of Contemporary Art in Belgrade 2018)

books *The Art of Computer Programming* (Knuth, 1968), and on the other, a short text by Dijkstra that condemns the usage of GOTO-statements in programming languages (Dijkstra, 1968), and later, the study *Structured programming* by Dahl, Dijkstra and Hoare (Dahl et al., 1972). New programming languages C and Pascal emerged, followed by tools like lex and yacc, as well as a crucial book about programming languages translation (Aho and Ullman, 1972).

Guiding the interest of young Institute associates towards modern programming topics of the time, primarily during their post-graduate studies, and under the leadership of professor Parezanović, led to forming a core team that dedicated its research activity to theorical and methodologic problems of programming. This new generation of programmers had obligatory courses during post-graduate studies that dealt with the theory of formal languages, the building of compilers and the theory of operating systems.

Nonetheless, through the development of an initial notion of scientific research in the Centre, it took almost an entire decade for a generation of young researchers dedicated to theoretical problems in programming to mature. The emergence of this generation is indicated by the launch of a permanent seminary in 1977 organized by the Mathematical Institute SASA and the Institute of Mathematics at PMF. In an account written by professor Parezanović, dating October 20, 1977, where he proposes this seminary, he calls it *the Seminary for Computer Sciences*, and suggests as discussion topics themes regarding operating systems, the theory of programming languages, translator's constructs, the correctness of programs, organization of data (structures and databases), as well as programming languages. He writes that, having in mind the associates' interests, he presumes that the seminary would gather around 20 participants.

The first seminary meeting was held already on November 8, 1977, with the topic The Analysis of the Finite-State Automatons by the Method of Isolating States, presented by Dušan Bratičević. This was followed by other regular meetings, with topics such as programming languages, data structure, correctness of programs, automated theorem proving, and other. Apart from the circle formed around the Computer Centre, the participants of the seminary were guests from other parts of Yugoslavia, including Suad Alagić from Sarajevo, Vlado Batagelj and Ivan Bratko from Ljubljana and others, as well as foreign guests. The contents discussed indicate the non-numeric character of the subjects, thereby clearly separating a new group of programmers from the ones who viewed programming primarily as a means for solving numerical tasks.

The Seminary is active to this day, with the occasional breaks, currently as the Seminary of the Department of Computer Science at the Faculty of Mathematics.[13]

5 Terminology

It is interesting that, at the beginning, it was disputed whether the seminary should be called "the Seminary of Computer Sciences" (*Seminar za računarske nauke*) or "the Seminary of the Science of Computers" (*Seminar iz nauke o računarima*), the uncertainty being resolved by the introduction of the term "computing" (*računarstvo*) coined by Prof. Slaviša Pešić the following year.

The problem regarding computer science terminology emerged at the very beginning of the seminary: the meeting held on April 24, 1978, was dedicated to terminology in computer science in Serbia. The participants included professors Đuro Kurepa, academician Mirko Stojaković, Slaviša Prešić and Nedeljko Parezanović from the Department of Mathematics, Mitar Pešikan from the Institute for Serbo-Croatian Language, Dušan Jović from the Faculty of Philology, and Vidojko Ćirić from the Faculty of Organizational Sciences. A transcript of this meeting was later published in the Slovenian journal *Informatika* (Vitas, 1978).

The need for creating a terminological system that would describe computer science concepts was present throughout the seminary. The ever-increasing number of computer science subjects in universities, as well as the process of introducing computer science courses into regular education, imposed the need for Serbian equivalents to the semantically non-transparent Anglicisms. Among the pioneering terminological solutions were *potisni* for *push-down* or *-liki* as a suffix corresponding to the English *-like*, such as *paskaloliki* (Pascal-like) or *algoliki* (Algol-like) *jezik* (language).

The English term "file", which nowadays is mostly used in the transcribed version as the Serbian *fajl*, is translated in (Kontić, 1974) as *datotetka*. Since this glossary was produced by translating the German column from the IBM English-German glossary, *datoteka* is probably a neologism coined from the adapted German term *Datei* (deduced from *Daten* and *Kartei*). Following this convenient, preliminary solution in the Serbian language, professor Parezanović proposed creating a word family consisting of compounds with *-teka*, coined in accordance with their contents: *programoteka* (program file),

[13] Seminary of the Department of Computer Science (on-line)

podatkoteka (data file), *audioteka* (audio-file), etc. Unfortunately, this convenient terminological solution did not survive in todays computer science textbooks.

The pinnacle of the efforts to establish a system of computer science terms was the work on the glossary that would enable the translation of *Oxford's Dictionary of Computer Science* (Ilingvort, 1990) to the Serbian language. After a series of successful translations of other dictionaries, the editor of the *Nolit* publishing house Slobodan Đorđević proposed creating a glossary that would enable the translation of Oxford's dictionary to Serbian. The terminology of the time (as well as todays) made this an impossible task. The example that the editor found particularly inspiring was the entry *middleware: products that in some sense occupy a position between hardware and software...* When translating these terms as *midlver*, *softver* and *hardver*, the translation of the above description seems like complete nonsense. The work on the glossary supported by the software developed on the IBM 360/44 lasted for several years, and the translation was finally finished in 1990, due to the editor's persistence and the patient and dedicated work by professor Parezanović on creating the glossary, with the help of Bogdan Janković and the author of this paper.

This dictionary was not accepted by the wider audience in Serbia, since it introduced a number of neologisms as substitutes for transcribed Anglicisms. However, many terminological solutions went into use, especially in computer science courses at the Faculty of Mathematics.

6 The Computing Laboratory

Despite the initial success of the Computer Centre, problems soon emerged regarding financing of computer science activities. One source of the problem was determining the real price of services provided by the Computer Centre that would cover – apart from the staff and basic material cost – the cost of the amortization of this (at the time expensive) machine. Given the social circumstances, however, this issue was put aside, probably because it was believed that the money for developing or replacing the machine could be provided by the funds for research and sciences. There were at least two reasons for the interruption of the development of the machine in 1972, which lead to its eventual loss of significance, and an end to its activities in 1986. On the one hand, many of the original users purchased their own machines and started working on them, resulting in lesser returns. Besides, rapid change in technology, especially new possibilities offered by operating

systems, made batch processing, especially through punch cards, adequate only for specific applications.

The other source of the problem was the unsolved issue of the internal distribution of funds. Before the computer equipment was installed, the Mathematical Institute was given government grants for scientific research. With the arrival of computers more funds began to flow in, mostly from business applications. In addition, this hybrid financing structure was occurring within a self-governing framework, where the distribution of funds was decided by employees through voting, according to the so-called "rewards according to performance" principle. This situation demanded a magic formula that would reconcile the two different financing systems and determine the satisfactory relation of price between the published scientific paper, as a criterion of scientific research, and a produced program, as a criterion of programming productivity. If one considers other factors, like investing in a program that has yet to gain a new user (for a lower price than the real one), financing programs based on scientific merit and not commercial value, or categorizing them as a scientific result, it was practically impossible to solve the problem of fund distribution to everyone's satisfaction. What is more, this led to an increasingly deeper division between theoretical researchers and the programming section of the Institute, which further narrowed the space for achieving the goals stated in (Vujičić i Čavčić, 1972).

During the mid-1982, the author of this paper was named the head of the Computer Centre with the primary task of resolving the issue of equipment renewal. In those days, the first personalized computers had already emerged, but also a whole range of computer fields, from the Japanese project of the so-called Fifth generation of computers, to the intense development of office automation systems. These new programming ideas were impossible to follow on a machine with the punch card as the sole medium for input, and printer for output.

The amortization saved during the 15 years of the Centre's activities was hardly enough for purchasing in 1983 one of the "better" micro-computers of the time, like *Partner* by Iskra in Kranj.[14] A new concept was needed in order to solve accumulated problems and pave the way for further development of computer science at the Faculty of Mathematics.

At the same time, the need for renewal of equipment emerged in other parts of the former Faculty of Science and Mathematics, especially among physicists and chemists. Instead of the time-worn and isolated IBM 360

[14] Micro-computer *Partner* produced by Iskra, Kranj (on-line)

system, the purchase of new equipment was considered, which would satisfy both the needs of intensive calculation and the needs of teaching, and provide access to networks already established in Europe. A small group of young researchers, including Svetozar Niketić from the Department of Chemistry, Dževad Belkić from the Institute of Physics, Dragan Krpić from the Department of Physics, Nikola Tucić from the Department of Biology, Gabor Mesaroš from the Institute for Biological Research, Cvetana Krstev and the author of this paper, under the patronage of professor Parezanović, worked out a concept for modernization that solved the above-mentioned problem in a satisfactory way.

It was clear, based on the experience with the Computer Centre at the Mathematical Institute, that the procurement and maintenance of a high-performance machine went beyond the available finance of the Faculty of Science and Mathematics and the Institute. The only solution was to rent time on some of the existing machines that enabled simple transfer of application from the 360 system and clear the way for their further development. One favourable circumstance was that the head of the Statistical Office of the Republic of Serbia (RZS) had close ties with computer scientists at PMF. At that time, the centre of RZS made plans to replace the existing system with a new IBM machine. At the end of the 1984, during negotiations between the representatives of RZS (particularly the head of their Computer centre Mile Todosijević) and the representative of PMF, a cooperation was agreed, allowing researchers and students from PMF to use RZS's resources. This agreement was part of the argument which enabled RZS to purchase the IBM 4381 MG14 machine in 1986.[15] The resources of this machine were used for lectures and research in the fields of mathematics and natural sciences. From an organizational perspective, this implied a highly complex transformation of the Computer Centre (see Figure 4). On the one hand, the Computer Centre was displaced from the Mathematical Institute at PMF, as a new organizational unit – work community,[16] and named Computing Laboratory. This new unit took over the staff, equipment and work that previously belonged to the Mathematical Institute. The Computing Laboratory even got its own bank account, thus gaining financial independency that the Computer Centre did not have.

[15] IBM 4381 Processors (on-line)

[16] Back then, work communities were organizational parts of institutions that served its other parts. That is why, for example, the administration or accounting services were organized as special organizational units – work communities.

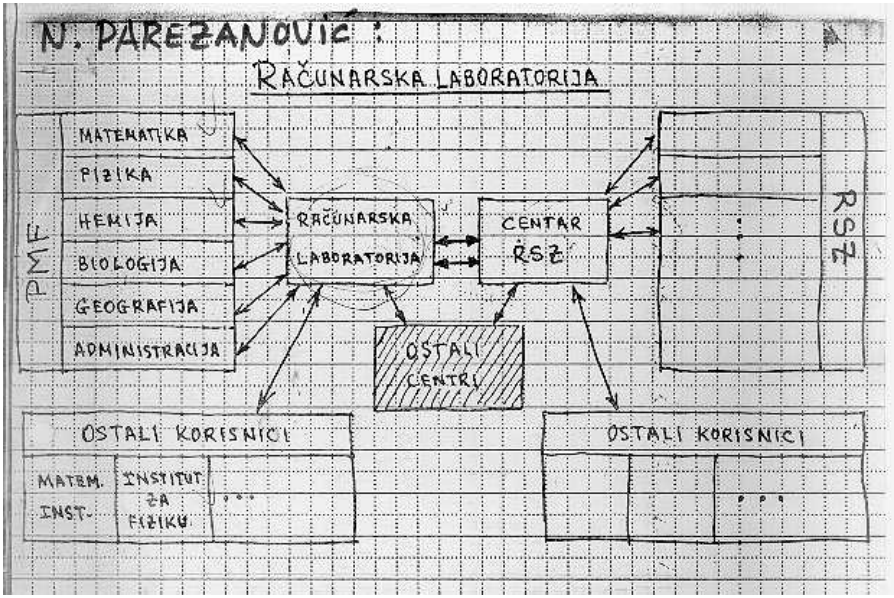

Figure 4. The concept of the Computing Laboratory outlined by professor Parezanović

The equipment for the Computing Laboratory was purchased from joint funds of departments at PMF, the Institute of Physics and the Institute for Biological Research. The equipment consisted of two clusters with 15 monochrome terminals of the 3278/2[17] type and one colour graphic terminal 3279/3 connected with RZS through rented telephone lines. Apart from this, two personal computers were purchased, one IBM PC Junior (with two floppy-disk units) and one IBM PC XT (with a 10Mb fixed disc and a 128Kb memory). To my best knowledge, those were the first "serious" personal computers at PMF.

7 The Development of the Computing Laboratory

The Computing Laboratory was launched in January 1985, providing computer science students facilities for practical exercises and researchers with access to a high-performance machine where one could execute programs with high demands for processor time, and allowing former users of the Computer Centre to harmlessly migrate to a new ambient. This way, and for the second time, conditions were met for an accelerating development of computer science, as imagined when the Computer Centre was established, which meant integration of three components: research, teaching and cooperation with commerce (Parezanović et al., 1988).

As for research, the Laboratory had, since the very beginning, participated in several significant projects in the period until 1990, like the scientific research project "Computer Science with Application", the sub-project "Computational Understanding of Natural Languages" in the scope of the project "Artificial Intelligence with Application", and the sub-project "The System of Student Services" as part of the developing project "The Integrated Information System of the University of Belgrade" (Krstev et al., 1988), financed by the Republic Scientific Community. For the needs of the Federal Standardization Office two application projects were realized: "Adaptation of TIT-thesaurus from the English to the Serbo-Croatian Language" and "Long-term Program of Standardization in the Field of Computer Science" funded by the Federal Ministry of Science.

As for the last major users of the Computing Laboratory, the Faculty of Forestry and State Enterprise "Srbijašume", for whom a complex application for the management of state forests on the territory of Serbia and Montenegro

[17] IBM 3270 terminals (on-line)

was developed, their software was transferred to an RZS machine, while the massive data input was left in the Laboratory (Jović et al., 1987).

A notable success following the transformation of the Computer Centre was when PMF joined the European Academic and Research Network (EARN). This network, formed in 1983, connected university institutions across Western Europe and was a branch of the American BITNET. Eastern European countries were not able to join, probably because of both political and technological reasons. Joining this network implied creating a national node, which had to be one of the host IBM machines in an academic institution. In former Yugoslavia, only PMF satisfied this necessary technological condition for joining. And so, thanks to the creation of the Laboratory, and relying on the support of RZS, in 1986[18] PMF was already experimentally included in this network, which provided researchers from institutions gathered around the Laboratory with (up to then) unimaginable services, like e-mail, forum access, or file transfer. Later, other institutions of the University of Belgrade joined this network, as well as institutions from other parts of Yugoslavia.

Thanks to the experience with a network like EARN, a group of researchers from PMF, gathered around the Laboratory, conceived the Specialized system of scientific and technological information[19] in the field of mathematics and natural sciences. At the contest, organized by the Federal Ministry of Science, for the choice of a specialized systems implementer as part of SNTIJ, their proposal was selected, and the implementation duties were given to PMF. Contrary to other parts of SNTIJ, which focused on building library systems for specific areas, this proposal was based on an integrated support for research activities that would be accessible to researchers through the network. This sort of conception was an early articulation of a typical research ambient of today, but in that time, it was a Copernican turn in organizing provision of information (Vitas, 1990; Витас и др., 1991; Vitas et al., 1990) .

This dynamic beginning of the development of the Computing laboratory was put to an end in 1990, with the disassembly of PMF into separate faculties. The Laboratory was incorporated into the Faculty of Mathematics, where it has stayed to this day.

[18] The issue of wider joining was not just a technological and financial question, but gained a political dimension as well.

[19] *Specijalizovani sistem naučnih i tehničkih informacija Jugoslavije* (in Serbian) – SNTIJ

8 Conclusion

Most of the facts revealed in this paper have been covered by oblivion. Nowadays, given the omnipresence of computer and information science, it is hard to even imagine the gradual development of computer science and its separation into a distinct discipline. Resistance, still very present, especially in conservative university circles, was slowly overcome, only thanks to visions of development, which in the last half of the century have always belonged to professor Parezanović.

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