

COMPUTER PIONEERS OF CIS COUNTRIES

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The first computers were intended basically for military purposes. The inherent secrecy of this work thus brought a great disconnection among the scientists of the world and caused parallelism in research (as opposed to scientific collaboration). This has left its mark on the objectivity and completeness of computer history. It is still full of "blank spaces". Quite a number of outstanding scientists still have not received their due in the world of computer history and development. This is of particular concern to the scientists of the former Soviet Union.

In 1995, the book "Computer pioneers" by J.A.N.Lee, Information Technology scientist at the Virginia Polytechnic Institute (USA), was published. This book contains more than two hundred biographies of computer pioneers from all over the world. But, of the many outstanding scientists from the former USSR, this book mentioned only two: V.M. Glushkov and A.P. Ershov. Whereas it is possible to note the names of, at least, 25-30 outstanding Soviet scientists who were real computer pioneers.

The report is devoted to the life and creative work of the prominent scientists S.A. Lebedev, I.S. Brook, B.I. Rameev, V.M. Glushkov, M.A. Kartzev, H.Y. Matuhin, N.P. Brusentsov, I.Y. Acushsky. Due to their efforts and enormous self-sacrifice in the work they guided, the Soviet Union in 50 to 60 years became one of the world's leaders in computer development. Computer technology in USSR in this period developed in its own way, based on the outstanding scientific results of its computer pioneers.

They were contemporaries of well-known to all world computer pioneers: von Neumann, J. Atanasoff, H. Aiken, J. Mauchly, K. Zuse, A. Turing, M. Wilkes and others. Nevertheless, because of the Iron Curtain, the "Cold War" and the secrecy of their work, their names were largely unknown in the West. Now, the outstanding results of their creativity should at last become an appreciable page in world history.

In the first blush of science and technological development after World War II, appeared a unique cluster of quite gifted Soviet scientists: Kurchatov, Korolev, Keldish, Lebedev and many others. They provided the main impetus and direction for science, engineering and particularly, the creation and development of computers. Actually, the appearance of the computer enabled the execution of brilliant projects in the field of space exploration, nuclear energy, rocketry and so on. In the rate of industrial development after World War II, the Soviet Union outstripped all countries in the world except Japan.

The founder of the native computer industry was academician S.A. Lebedev. S.A. Lebedev was born on November 2, 1902 in the town Nigniy Novgorod. By the time he was 45 years of age he was a well-known expert in energy systems. His book "Stability of Parallel Work of Electrical Systems" (co-author A.S.Gdanov) was reprinted in many countries. And the research he carried out required the creation of enormous computer facilities and the computerisation of bulky accounts. Since the forties, this has been the main Lebedev's work.

In parallel with American and English scientists at the end of forties, he developed the main principles of construction and structure of electronic digital computers. Under his management in 1948-1950, the first stored program computer in Ukraine, Soviet Union and continental Europe was created. In 1951-1953, this computer (MESM) solved very important problems from thermonuclear engineering, rocketry, space flights, long distance electrical transmission and so on.

The following twenty years, after his move from Kiev to Moscow, saw him develop fifteen high-performance types of computers. Each of them was the latest word in computer technology - more productive, reliable and convenient in operation (BESM, BESM 2, BESM 4, BESM6, M-20, M-40, M-50 and others).

During that period, one can find no level of creativity comparable to his in Western world, neither in the USA nor in Europe. All the computers created under Lebedev's supervision (from electronic tubes to integral circuitry base) were manufactured and used in computer centers of large scientific-research institutions as well as in anti-missile systems of the Soviet Union.

From the early stages of creative activity, S.A. Lebedev put forward and in subsequent years consistently realized the basic ideas for supercomputer construction, i.e. the paralleling of the computing process. In the first computers, he used for this purpose parallel arithmetic units, then concurrent work of mainframes and later on - pipeline algorithms and structures, multiprocessing, etc.

The German philosopher Frederick Nietzsche stated that: "Being good at defining the direction is a sign of genius". This quotation is used as epigraph in the book about S.A. Lebedev.

Hundreds of highly skilled specialists and engineers gained valuable experience in Lebedev's institute and have become famous scientists, chiefs of scientific research centers, and designers of new computers (academicians Melnikov, Burtsev, Rjabov, Ivannikov, Doctors Sokolov, Tjapkin and many others). The institute established by Lebedev continues the work of creating modern super-computers in our time.

It is worth mentioned another prominent computer scientist of that same period, academician Isaak Brook and his famous pupils, N. Matjuhin and M. Kartsev. Isaak Brook was born in Minsk on the 8th of November 1902 (the same year as Lebedev). Like Lebedev, Brook began his career working on problems of energy systems. In 1948, together with B. Rameev, Brook designed the first computer project in the Soviet Union and got the first patent on a computer with a Unibus. Under Brook's supervision, the M-1, the first stored program computer in the Russian Federation was created. The M-1 was put into operation in 1952, two or three months after the MESM in Kiev. For the first time, it used semiconductor diodes instead of electronic tubes, a two-level address command system and teletype for data output.

Under direction of Brook and active participation of Kartsev and Matjuhin the M2 (1953) and M3 (1956) were created. The latter became the initial model for a popular family of computers, MINSK (G. Lopato, V. Prjyalkovsky).

The first prototype of the M-2 computer was manufactured and put into operation a little bit later than BESM, with comparable performance. It was maintained at the Institute of Energy for more than 15 years. Matjuhin, who was the chief designer of the M-2, later on became the chief designer of the family of computers and complexes for anti-aircraft systems. Under his leadership, 10 types of computers for such systems were developed. The first used semiconductors, the later ones, integral circuitry. Both functioned reliably for anti-aircraft systems. In 1986, the system detected the Rust aeroplane, though the decision to enable the system was denied and the plane landed at Red Square.

The powerful computers M-4, M-10 and M-13, created under Kartsev's supervision, were responsible for multi-computer complexes for outerspace control and for missile-attack warning systems. Although the M-10 was slightly slower than the American supercomputer Cray-1, it surpassed the Gray-1 in versatility, inherent in its architecture: the number of cycles for one operation for M-10 was from 0.9 up to 5.3 (for the whole spectrum of operations) while the Cray-1 was from 0.7 to 27.6. From the computers developed by Kartsev's Institute was created the largest in the USSR multicomputer complex. This complex consisted of 76 computers which were connected by ten thousands kilometers of information channels working at uniform algorithm. In

multiprocessor system of the fourth generation M-13 an equivalent speed of special purpose system processors was more than 2 billion operations per second.

Kartsev realized the conception of multiformat vector structure and absolutely parallel computing structure that enabled it to solve complicated problems requiring super-performance computers. M.Karsev is the author of fundamental theoretical works. He wrote four monographs on the fundamentals of computer arithmetic and computer architecture.

Although Kartsev is not mentioned amongst the computer pioneers of the Lee book, undoubtedly he was and remains a remarkable figure in the history of world computer science and engineering.

It should also be mentioned that while Lebedev and his group ensured the development of supercomputers, computer technology more widely used was designed by B.I. Rameev in provincial Penza. Rameev had no possibility to get a higher education because his father was punished by Stalin's regime (later on he was rehabilitated). Nevertheless, due to his outstanding abilities, Rameev became chief designer of the "Ural" family of computers. These computers were inexpensive and were widely used at the former Soviet Union's computer centers. Under Rameev's management, a whole family of special purpose computers were developed, as well as about 100 peripheral devices.

It is also worth mentioned here that Rameev was the deputy of U.Y. Basilevsky, who was the chief designer of the first manufactured computer, "Strela", that appeared simultaneously with IBM 701. Rameev was also the first in the USSR to formulate and realize in the Ural-11,-14 and 16 computers, the principle of programming and hardware compatibility. He formulated this important idea one and a half years before the production of the IBM 360 - software and hardware compatible computers. It's a pity, but his name is also practically unknown in the West.

As for V.M. Glushkov, of course he deserved to be included among the computer pioneers. He was born on 24th of August 1923 in the south of Russia. The name of Glushkov in the history of development of computer technique is connected first of all with the development of the theory of computer design in his well-known books, "The Theory of Digital Automation", "Introduction to Cybernetics" and so on. The next very important part of his work in this field in 50's and 60's were his investigations in the field of control computers and computers with high inner intellect.

Under his guidance, a series of specialized computers for engineering calculations, the MIR-1, MIR-2 and MIR-3 were designed and became the forerunners of personal computers.

The Kiev Cybernetics Institute was founded and guided by Glushkov. It was at the time the one of the well-known computer institutes in the Soviet Union and very quickly gained international recognition. The crowning achievement of Glushkov's work was undoubtedly the creation of the ES-1766 (macropipeline) supercomputer, which had no analogue in the world at the time.

In the 60's and 70's, the computer industry in the Soviet Union manufactured more than fifteen types of computers, designed at the Institute of Cybernetics (Promin, MIR-1, MIR-2, MIR-3, Dnieper, Dnieper 2, Neva, Iskra 125, Pirs and others).

"The scientific works of Glushkov and the practical results of his research for many years will have an influence on the development of computer science all over the world", according to H. Zemanek, an eminent computer design scientist from Austria.

In July 1970 in England, a forum entitled "The Fundamental School of Computer Technology Pioneers who have Created its Past and will Form the Future" was held. Only eight countries were invited to participate, including the Soviet Union and particularly represented by Ukraine. This would suggest that the Ukrainian contribution to Computer Technology has been significant.

Besides "classical" computer facilities developed by the scientific schools of Lebedev, Brook, Rameev and Glushkov, significant contributions were made by N.Brusentsov in 1958, with a computer using the ternary notation system "Setun" and by I.Akushsky also in 1958 who developed the first and probably the only world special computer using notation in remainders.

There are a number of other designers in the field of universal, onboard computers including V. Polin, Y. Hetagurov, V. Levin, S. Majorov, V. Smolov, A. Larionov, V. Prjiyalkovsky, B. Kagan, and others, but their description is beyond the scope of this report.

The Iron Curtain has fallen and the time has come to fill in the "blank spaces" in the list of world computer pioneers.

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