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50 Years Ago we Constructed the First Hungarian Tube Computer, the M-3: Short Stories from the History of the first Hungarian Computer (1957-1960)

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Abstract: The M-3 computer was constructed by members of the Cybernetics Research Group of the Hungarian Academy of Sciences (Hung: Magyar Tudományos Akadémia Kibernetikai Kutató Csoportja, abbr. MTA KKCs) from mid 1957 until the beginning 1959. I was a member of MTA KKCs until 1967. The Group was established for the sole purpose of constructing the first Hungarian electronic tube computer, first the B-1, then the M-3, which began the age of computers in Hungary. We received the basic design of the M-3 computer – mid 1957 - from the Soviet Union, but we received the necessary parts (vaves, cuprox diodes, connectors etc.), too, we used only resisitors and capacitors from a Hungarian plant REMIX. The whole mechanical and electrical construction (logical unites, casing, drum etc.) was done by our mechanical engineers and our mechanical and electrical workshop.

Keywords: Hungary, MTA KKCs, tube computer, first computer-program in Hungary, first computer music, drum, first Hungarian computer export.

1. Introduction: the B-1 computer

The idea of constructing a computer was born in the Central Prison of Hungary. During the very hard Communist era (mainly the late forties and early fifties) the political leader of the state, the Communist party declared the workers and peasants to be the ruling class. Some Hungarian intellectuals, considered as the enemies of the communist political system, were sent to prison by courts of “justice”.

Dr. Rezső Tarján was an insurance mathematician, but in the beginning of the fifties, he became the head of the board of directors in the Ministry of the Industry. He had a lot of personal and official connections with other mathematicians mainly in the Western countries, therefore – in 1953 - the political police constructed „a legal procedure” against him and he was imprisoned. The charge brought against him was: espionage.

During his prison time, he was working in a technical development organisation of the prison, KÖMI 401, together with other two intellectuals: **József Hatvany** physician and **Dr. László Edelenyi** mechanical engineer.

They knew about the American and the English computers, therefore they decided, they will construct a Hungarian electronic serial computer, similar to EDVAC

/EDSAC. He gave a name to the imagined computer: **B(udapest)-1**. They prepared a preliminary study about the future computer, and the director of the KÖMI 401 sent it to the Mathematical Department of the Hungarian Academy of Sciences (HAS). They – naturally - refused it.

The prisoners became free in 1955, the HAS permitted Dr Tarján to follow his research activity of B-1, which was started in the prison. Tarjan could first establish a Computer Department in the Institute for Measuring Technology and Instrument of HAS, a new institution, where several young engineer and mathematician joined him. Some months later the HAS permitted him to establish an independent institution under the HAS called the Cybernetical Research Group of HAS. (Hung. Abbrev.: MTA KKCs)

Tarjan was not satisfied with the new institution, because a Soviet emigrant electronic engineer, **Sandor Varga** was appointed to be the director. Tarjan got the scientific deputy director position. His colleagues from the Computer department, Hatvany and Dr Edelényi followed him to the MTA KKCs.

Several departments were organised in the frame of MTA KKCs, they started several different developments. The Group did not change their main task to develop the first Hungarian electronic computer, the **B1**. Tarjan employed several new members in the different departments of the MTA KKCs, mathematicians, economists, and engineers. The mathematicians studied the different numerical methods, and the different methods of the programming. The department of the economists collected a lot of applications and developed programs to solve them etc.

Tarjan employed several new and young engineers. *Fortunately, I was one of them.* Our task was to develop basic electronic circuits to the future computer: bistabil and monostabil multivibrators, gates, amplifiers etc. We were very new in the electronic engineer job, (we received our diploma more-less in 1956/57), we learned only the theories and not the practical work, but we started to develop the circuits of the B1.

We had a lot of problems: as I told, we had no practice, neither in the electronic engineering, nor in the computer construction. We hadn't seen any electronic computers earlier, though we could study the first relay computer (MESz-1) constructed by our professor: **Laszlo Kozma** in the Budapest University of Technology. We had none of the necessary knowledge to construct a tube computer, therefore we didn't succeed.

Varga was contrasted with Tarjan, the difference was between them: Varga did not want to develop a computer, his preference was to buy or to construct – as soon as possible – a usable computer. Varga also saw, that we – as young engineers – lacked the practical knowledge to develop and construct a new computer. Varga's first idea was to buy an electronic computer from the Soviet Union, but – in 1956 – the Soviet institutions could not sell computers. One of the first Soviet computer factories in Penza produced the first URAL computers only much later. Therefore this vision was not realistic, yet.

Varga (later Tarjan, too) visited his former Soviet research institution: the Institute of Energetics of Moscow, one of the first institutions constructing the first Soviet "Neumann concept computers". These computers were the Soviet clones of the American IAS computer.

2. The M-3 Computer

During his visit, they developed their first small-medium size computer, the M-3, they started to construct it, too. They offered Varga to give the constructional design of the M-3 computer to MTA KKC, then we could construct the computer in Budapest.

It is necessary to know that there was an agreement between the Socialist countries, called the “Sofia concept”, because this agreement was born in Sofia. The “Sofia concept” was: the members of the COMECON countries will give – free of charge – their scientific results to the other socialist countries. The M-3 was a scientific result, therefore we received it free!

Varga – and later Tarjan - accepted this opportunity, the documentation of the computer arrived soon – mid 1957 - if I remember well, in two large boxes to Budapest.

We knew that the similar M-3 design was given to the Cybernetical Research Institution of Estonia and the Chinese Academy of Sciences. A little bit later the first M-3 computer was transported from Moscow to Belorussia, Minsk, to the Ordzonokidze Computer Factory, where they manufactured it in a serial production. In China, they also constructed several M-3 computers, it was the basis of the first Chinese computer production. The design of the M-3 computer was given to Soviet Armenia, too, using this support they constructed their first Armenian computer, the RAZDAN.

The first M-3 computers (in Estonia, China, Hungary and in the Soviet Union) were constructed from the same source, but they were different, because we – in four countries – changed a “little bit” the original designs, and – additionally - we had no connections between the other “M-3” countries. The result was: the M-3 computers – the Soviet, the Estonian, the Chinese and the Hungarian – were not compatible with each other, because we did not harmonise our developments. We could not exchange any software between us, but – during this time – we believed, it was not necessary for anybody else. Everybody wrote their own programs and – generally – did not use the programs of his colleagues, absolutely the institutions used their programs in their countries and not outside of the countries. We did not recognise the importance of the compatibility and the exchange of the software.

Varga reorganised the whole technical department, he replaced Tarján, as the head of our scientific research and appointed **Balint Dömölki**, as the head of the computer development department. I became his deputy, as the responsible head of the technical (electronic) development.

During the construction of the computer my colleagues suggested (me, too) a lot of new solutions, such as: we changed some circuits in the arithmetic unit, we installed some new instructions of the instruction set, we developed a new magnetic drum controller for four drums, we replaced the old input/output devices (Siemens 100 teletype) to fast tape-reader and tape punch equipments etc.

I constructed an amplifier with a loud-speaker, connected to a monostabil multivibrator in the instruction control unit, which – during the computer operation – was oscillated in the voice dominion: between 50 Hz-10kHz. From the beginning of 1959, our computer became an „electronic music instrument”, too. A colleague of mine wrote a program, “Beethoven: Für Elise” playing by the M-3 computer.

In the first version of M-3 we used Russian commercial tubes and cuprox diodes, later we decided to replace the Soviet tubes with new long life tubes produced in Hungary. I constructed a totally new control unit for four magnetic drums, I used these new Hungarian Tungstram long-life tubes. I decided to replace the cuprox diodes with Tungstram produced Ge diodes, unfortunately this development was not successful.

We received from the Soviet Union the necessary logical, electrical etc. plans, but we did not get any working documentation of the computer. Balint Dömölki started to study the logical and electrical technical documentation on his own and he understood – step by step - the working method of the computer. He elaborated a new “graphical concept documentation”, it was together: a logical and a graphical description, including the circuits of the computer.

At the end we could construct the computer, but we understood the functions of the different parts of the computer from the documentation prepared by Dömölki, not from the original one.

The moment, when the computer – constructed by us – started to work, were very remarkable for us. We all were in the institute – night a day - more-less a week long, we did not go home, we were feeling, (we were sure) the start was very close. Our mathematicians had prepared several programs, they were waiting, too, for the first program to run. Then it happened, but we did not want to believe: our computer was working.

The speed of the first version of our computer was about 30-50 operation per second, our M-3 was in this time the fastest equipment for computing in our country, but it was the largest electronic machine, too. We did not believe that our first program ran successfully, because it was “unbelievably fast”!

Seeing our result, Mr Varga decided to hand the computer officially over to the representatives of the Hungarian Academy of Sciences, but several mathematician members of the Academy did not know what a computer was.

Varga had an excellent idea: to hand over the computer to one of the best Soviet computer engineers, who designed the M-3 computer. He was **Mr. G. P. Lopato**, chief constructor of the Soviet M-3.

The acceptance test of M-3 was conducted and successfully concluded on January 21, 1959, which was enough to the Presidium of the Hungarian Academy of Sciences. The committee - heading by Mr. Lopato - **declared the M-3 computer ready** and not only the institutes of the Academy but universities, different developers, factories etc. could use it.

After the successful acceptance test, our mathematicians and economists solved several – previously prepared - problems on the new computer not only from scientific domains, but also on the technical and economic life. A number of experts: engineers, economists, mathematicians, linguists and many others started to study computer programming using the machine to solve their own problems.

As soon as in the first few months of the operation of M-3 the KKC's forwarded calculations to the Planning Office solving matrix of the important 5 years economical plans of the socialist planned economy. We had a specialist studying the operation research tasks we also helped with linguistic statistics analyses, static calculations for a number of large building constructions. The final control of the

statical calculation of the longest bridge - the new Elisabeth Bridge - over the Danube, and many other tasks had been carried out by this machine.

3. The First Education Programs

We organised the first programming courses in Hungary, the participants were mathematicians, engineers, economists and other researchers. The MTA KKC's published the first computer periodical, its title was: "Tájékoztató" (Informatory). Our mathematicians delivered lectures on the new computer programming faculty on the University of Sciences.

In 1960, our colleague **Dr Béla Kreko** suggested and started a new faculty in the University of Economics called "Planing Mathematics". Béla Kreko wanted the University to train very well educated economists, knowledgeable in mathematics and computer science. Such faculty – I think – was one of the first not only in Hungary and the neighbouring – i.e. socialist – countries, but in all Europe, too. I was invited to organise and teach the computer science in this faculty. The students could study the M-3 computer with some of the ways the programs were running on the computer. I wrote the first university text book on computers. We - Dr Kreko and me - organised the first university computer centre – using an URAL 2 computer - on this university, too (1965).

When the M-3 was successfully tested and accepted by the Hungarian Academy of Sciences (1959), Mr Varga decided – naturally, we supported him – that we would design and construct a new, modern M-3 computer, but he did not ask for a permission from the Presidium of the HAS. We thought, he could not ever get a permission from HAS.

4. The First Computer Centre in Hungary

Mr. Varga reorganised the MTA KKC's, too, he changed the function and the name of the institution, he organised from a research institution the first computer centre in Hungary. This Computer Centre of HAS had several departments, I became the head of the Computer Operations Department. We were working very soon in three shifts, we stopped only in Christmas time. We interrupted the running programs in every 8 hours, 7 hours work and 1 hour maintenance, because the tubes running relatively short time, we had to change several tubes in each shift.

The secret, that we constructed a new, modern M-3 computer, without the permission of the Presidium HAS, became public very soon. The new computer was about 50 % ready. The Academy instructed us to stop our „illegal” work and disassemble the half ready machine. They declared, *the present M-3 is enough for five years long to the institutions of the Academy.*

Varga's penalty was, he was kicked out from the computer centre of HAS. The head of the economist's department was appointed as the new director: **Dr Istvan Aczél**.

5. The First Hardware Export from Hungary

Dr Aczél's – as the director – first official trip was to Romania, in 1960, to a computer application conference. He met there two young scientists, **Dr Josef Kaufmann** mathematician and **Viliam Löwenfeld** electronic engineer, from the University of Timisoara. They informed him, they constructed a computer, its name is **MECIPT-1**, they tried to buy a memory in the Soviet Union, but it was impossible. They asked dr Aczél, to help. Aczél asked me, „*whether we could give a drum to Timisoara?*” I answered: „*Yes, we can, because I prepared in our Computer Centre several reserved drums, if one became defective, we could change it very soon*”. Additionally I gave the drawing of the control unit to them, what I constructed earlier, then we delivered the drum, connected to the computer, which was running without any problems. Naturally: free of charge.

It was the first Hungarian export of computer hardware to abroad. The MECIPT-1 was working till 1968, then they hand over to the Museum Banat in Timisoara.

Unfortunately the MECIPT-1 was not very well accepted by the Ceaucescu political regime. The two designers were Roumanian citizens, but Kaufmann was of Hungarian origin, Löwenfeld was of German origin, additionally Jewish persons. I was – an original Hungarian – as the third designer (drum). A little bit later, the Museum received a political instruction, they have the MECIPT 1 to kick out from the Museum. Then nobody knows, where was the computer. I was several times in Timisoara, I tried to find the MECIPT 1, but I was not successful.

In 2002, I delivered a lecture in Timisoara then I met a young journalist, **Zoltan Pataki**. I asked him about the MECIPT-1. He asked several other journalists, and we were very fortunate, because we found it in a cellar of the Timisoara Fortress. Then the Alcatel telecommunication company exhibited it, in the same place, in the reconstructed cellar. Whenever I was in Timisoara, I usually visited the MECIPT-1, during at the end of the last year, too. This time I was surprised, because the MECIPT 1 museum was reconstructed, the computer was disassembled and stored in a dirty and unprotected room.

6. Ceaucescu's Spirit is Alive

The M-3 was transported to Szeged, and the end of the M-3 computer. Returning to the M-3 story, our computer was running 24 hours daily. A lot of users were coming from the different research institutions, universities, but from different workshops, too. They solved a lot of mathematical, economical and technical problems it was a great occasion for the scientific and practical researchers performing their calculations with an electronic computer.

The M-3 computer operated at the Hungarian Academy of Sciences' Computer Centre till 1965, when HAS bought a new URAL 2 (also tube) computer from the Soviet Union. The M-3 computer was transferred to the Cybernetics Laboratory of the József Attila University of Sciences, Szeged, which was headed by Academician **László Kalmár**, Professor of Mathematics and Logic in the University. We had the

opportunity to establish the first Computer Centre in the country-side. The head of the University's Computer Centre in Szeged was **Dr Dániel Muszka**.

In 1968 the M-3 became outdated again, the computer was disassembled and the parts of the M-3 were then distributed among the various departments of the university.

The greatest achievement of the development of M-3 was the very early introduction of computer culture to the Hungarian scientific and research community. The M-3 was and still is the symbol for the beginning of the age of computers in Hungary.

7. Technical Characteristics of M-3

7.1 Arithmetic unit

31 bits/word, parallel computing, four registers, operational speed: addition: 60 microsec, subtraction: 70-120 microsec, multiplication: 1.9 millisecc, division: 2,0 millisecc.

7.2 Input/output device

First: Siemens T-100 teletype, tape reader and puncher, 5 position telex code, input/output speed: 7 chrs/sec.

Later the input device was a Ferranti photoelectric tape-reader, 8 position code, speed: 300 chrs/sec, the output device was a Creed puncher, 8 position code, speed: 100 chrs/sec.

7.3 Memory

First a magnetic drum, 1 kWord (later: 1,6 kWord) capacity,

Later as back ground memory... two - simultaneously - running drums were operating together (2x1600 Words), then, as operating memory: a ferrit core memory, its capacity was: 1 kWord.

7.4 Control Unit

Two address code, 31 bits per instructions, 1 sign bit, 6 bits for operational code, 12 bits first address, 12 bits second address

7.5 Power supply

Total power dissipation: about 10-15 kW.

7.6 Parts used (approximate numbers)

About 500 logic units, about 1000 vacuum tubes, about 5000 cuprox diodes, about 4000 resistors, about 3000 capacitors.



Fig. 1. Original photos of the M-3 computer. The only documentation of the successful acceptance test in the daily newspaper – 21. January. 1959. Wednesday - Esti Hírlap: the first Hungarian electronic computer - the M-3 - is ready. The engineering Group: from left to right: S. Pohradzsky – later: A. Röhrich, – I. Ábrahám, I. Molnár, L. Szanyi, Gy. Kovács, Zs. Várkonyi, B. Dömölki (in the shadow: K.Kardos)



Fig. 2. Gy. Kovacs and the drum memory of the M-3

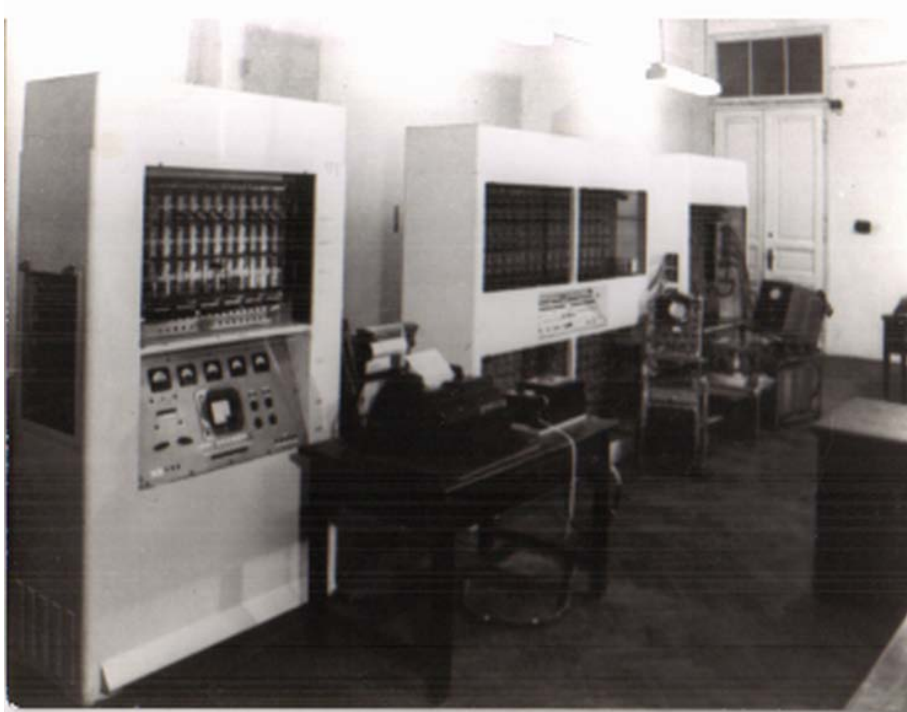


Fig. 3. The M-3 computer is ready.

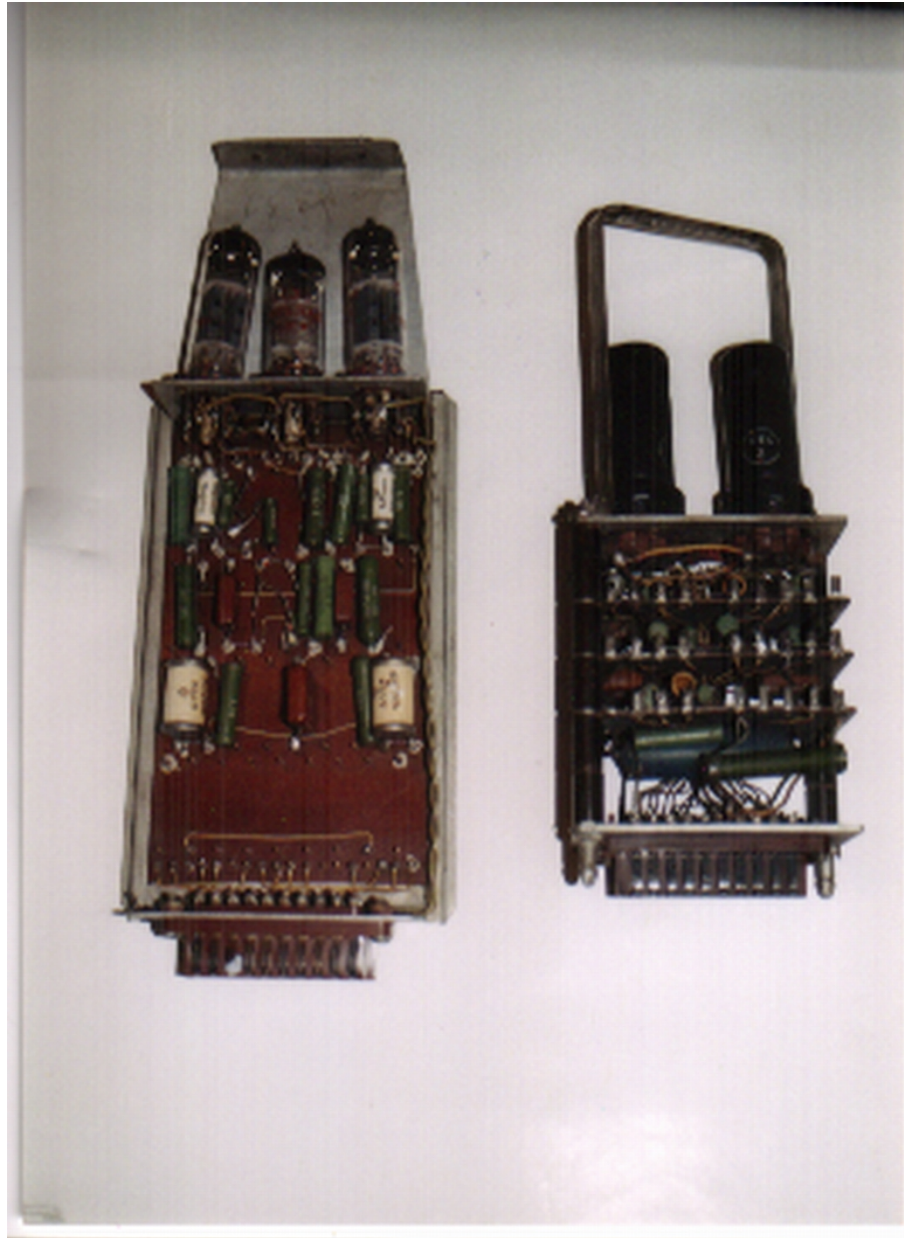


Fig. 4. The logic units of the M-3 computer, (left) the new developed drum controller-unit, with Hungarian produced long-life tubes, (right) the old unit, original Soviet design with Soviet elements.



Fig. 5. I found the MECIPT-1 with our drum in a cellar of the Timisoara Fortress (2002)

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