SOVIET CYBERNETICS:

Recent News Items

No. 4

Wade B. Holland
Editor

May 1967

{THE BESM AND M-20 SERIES:
Descriptions and Photos}

P-3600/4

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In this issue...

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ROGER E. LEVIEN, Project Leader
WILLIS H. WARE, Head, Computer Sciences Department

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THE BESM AND M-20 SERIES OF COMPUTERS

Wade B. Holland

Soviet computer designers have only recently begun to develop true computer family groups. There have been in the past several series of very similar machines, in the sense that the same electronic modules were used for each member and input/output functions were based on the same hardware capabilities.* But only the more recent Ural line of computers constitutes a family of machines in approximately the same sense as the term is used in the West. This family consists of the Ural-11, -14, and -16, three increasingly-powerful machines that are modular in construction and derive from the general-purpose elements of a basic machine, the Ural-10.†

The BESM and M-20 computers are not a family of machines in the Western sense or in the sense of the new Urals. They represent successive design generations, produced by a team headed by Academician S. A. Lebedev, director of the prestigious Institute of Precise Mechanics and Computer Engineering‡ of the USSR Academy of Sciences.

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*The early Ural machines, Ural-1, -2, and -4 are examples of this type of family similarity, as are the Minsk-1, -11, -12, -14 series and the Minsk-2, -22 series. These represent examples of successive refinements to a base machine, generally in the direction of greater internal storage and more I/O versatility.

†See SC:RNI, No. 1, pp. 23-24, for a brief description of these Ural machines. The Ural-16 is still under development; Ural-11 and Ural-14 machines are in use and believed to be in production.

‡Sometimes translated as Institute of Precision Mechanics and Computer Technique (IPMCT).

On the following pages are pictures and brief descriptions of the different BESM computers and of the M-20. The acronym BESM stands for "high-speed electronic calculating machine" (bystrodejstvuyushchaya elektronnaya schetnaya mashina); the "M" in M-20 apparently represents "machine" (mashina).

BESM-1

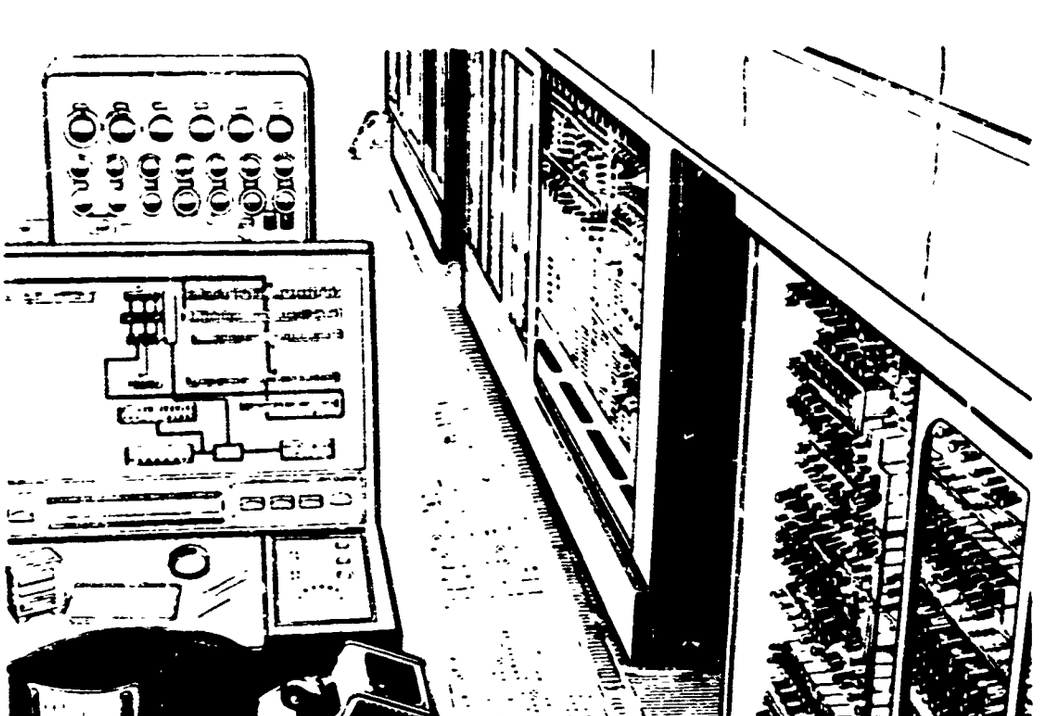
S. A. Lebedev designed the Soviet Union's first electronic computer, the MESM, beginning in 1948 at the Computer Center in Kiev. Shortly thereafter, Lebedev went to Moscow to head the Institute of Precise Mechanics and Computer Engineering and to design the BESM, the country's first large computer. The first BESM was completed around 1952 at the Institute and connected by off-line teletype with the nearby Computer Center of the Academy of Sciences of the USSR.

Until about five years ago, the accompanying picture of BESM-1 was the standard photograph used by Soviet authors as an example of an electronic computer; often, the artist's line drawing was used instead. Only occasionally was the depicted machine identified by name.

BESM is a binary, 39-bit, 3-address machine with floating point; it has some 4000 tubes and was originally supplied with an acoustic delay-line store. This store was later changed to a Williams-type electrostatic store, and in the late '50s to a magnetic core store of 1023 words of 40 bits each, expandable to 2047 words (there is no evidence that this memory expansion was ever realized). Input is from papertape at 20 words/sec; output is to a

BESM - 1

(01431P)



BESM-1

numeric printer at 1000 14-column lines/min or to a paper-tape punch.

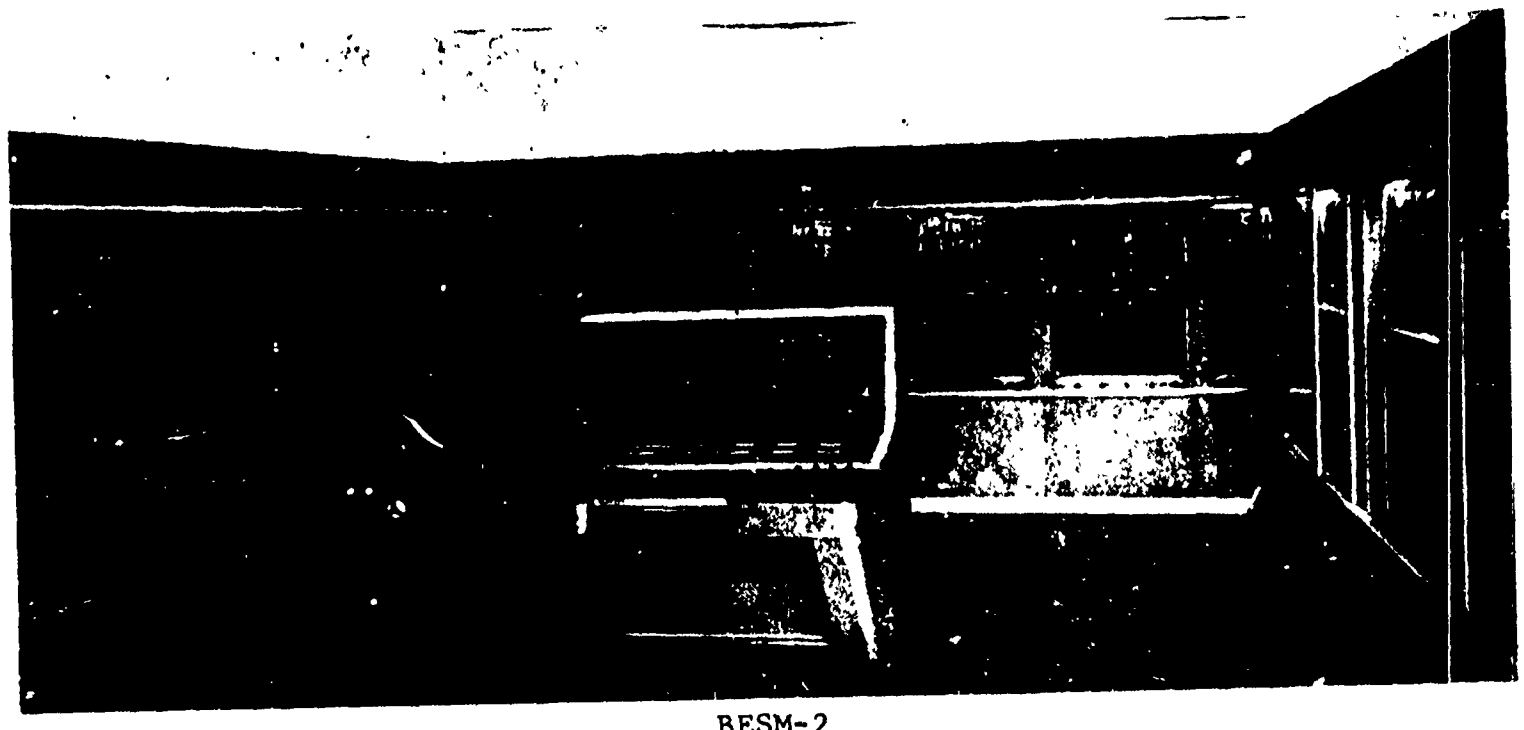
Based on a formulated mix of operations, its speed is usually rated at 7000-8000 opns/sec. Cycle time is 10 μsec. It is equipped with a 5120-word drum and four 30,000-word magnetic tapes, plus a 400-word read-only plug-in store.

Only one BESM-1 is known to have been made, although there is some indication of as many as three. It is most likely, however, that other BESM-1 units are actually BESM-2 machines or one-of-a-kind prototypes somewhere between BESM-1 and BESM-2.

BESM-2

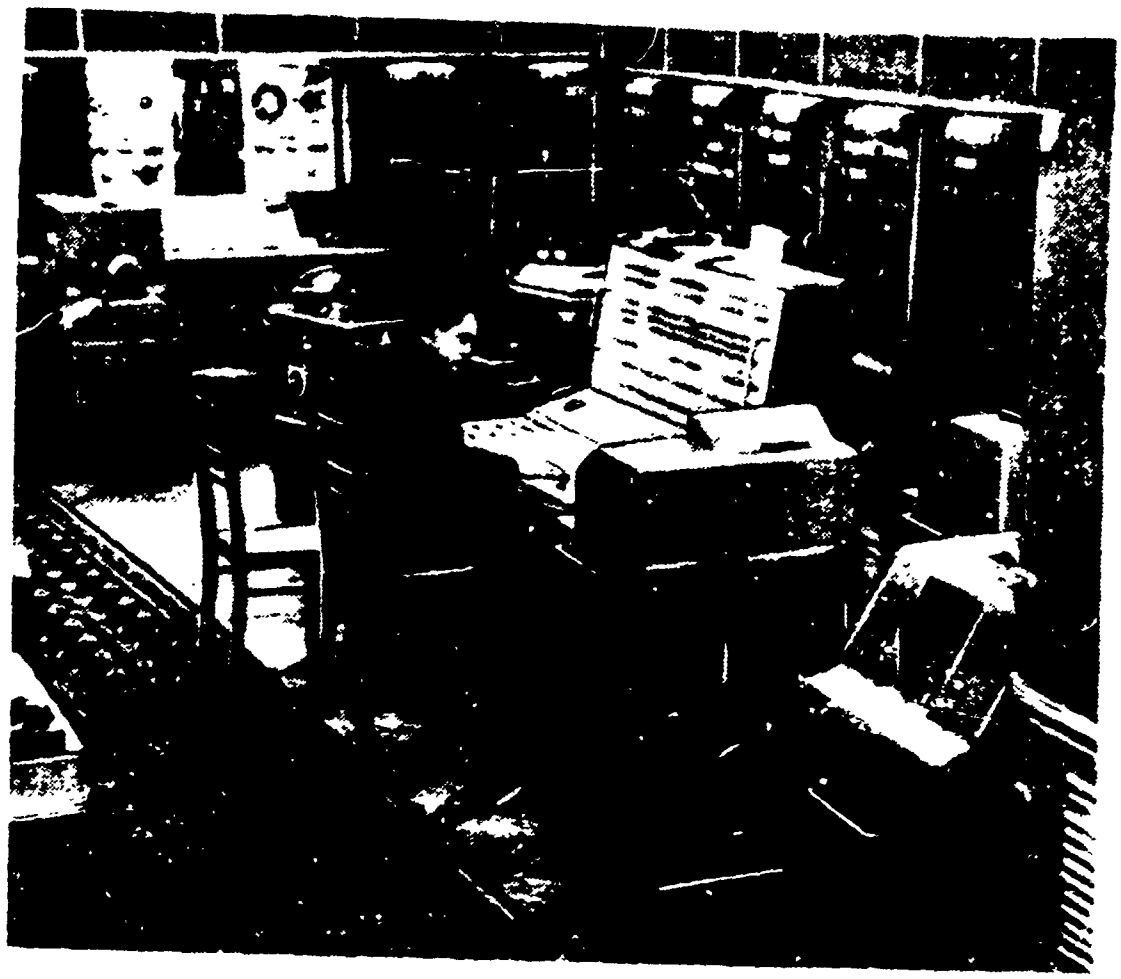
Work on BESM-2 at the Institute of Precise Mechanics and Computer Engineering began almost immediately after completion of BESM-1. It proceeded rather slowly, however, and the machine was not completed until early 1959. It differs from the BESM-1 in its use of semiconductor diodes and its greater memory capacity. The logic and circuitry of the two machines are essentially the same, although there are some modifications in the later machine; the two are reportedly program-compatible. In general, BESM-2 represents no technological advances over the BESM-1, but does incorporate a number of refinements and improvements.

The prototype unit of the BESM-2 was assembled at the Academy of Sciences' Computer Center, and engineers from the Center participated in its design. BESM-2 was a production machine and is still in wide use throughout the Soviet Union.



BESM-2
(Believed to be prototype model)

(01418P)

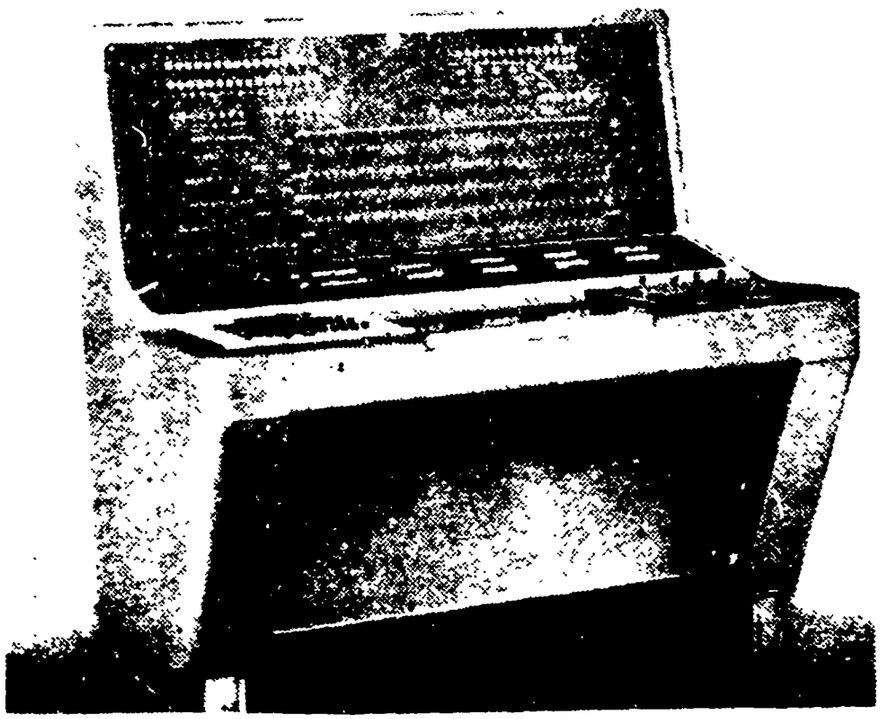


BESM-2 Computer

(01349P)

BESM-2 Computer

(01349P)



BESM-2 Control Console
(Believed to be production model)

It is a 3-address, binary machine, with floating point and 39-bit words. It has a 2048-word core store, at least two drums storing 10,000-12,000 words, and four magnetic tape units with a total tape-storage capacity of 100,000-200,000 words.* Input is via papertape at 15-20 words/sec, and output is to a line printer at about the same speed. Punchcard I/O units can also be utilized, with a 300-card/min input and output at 100-200 cards/min.

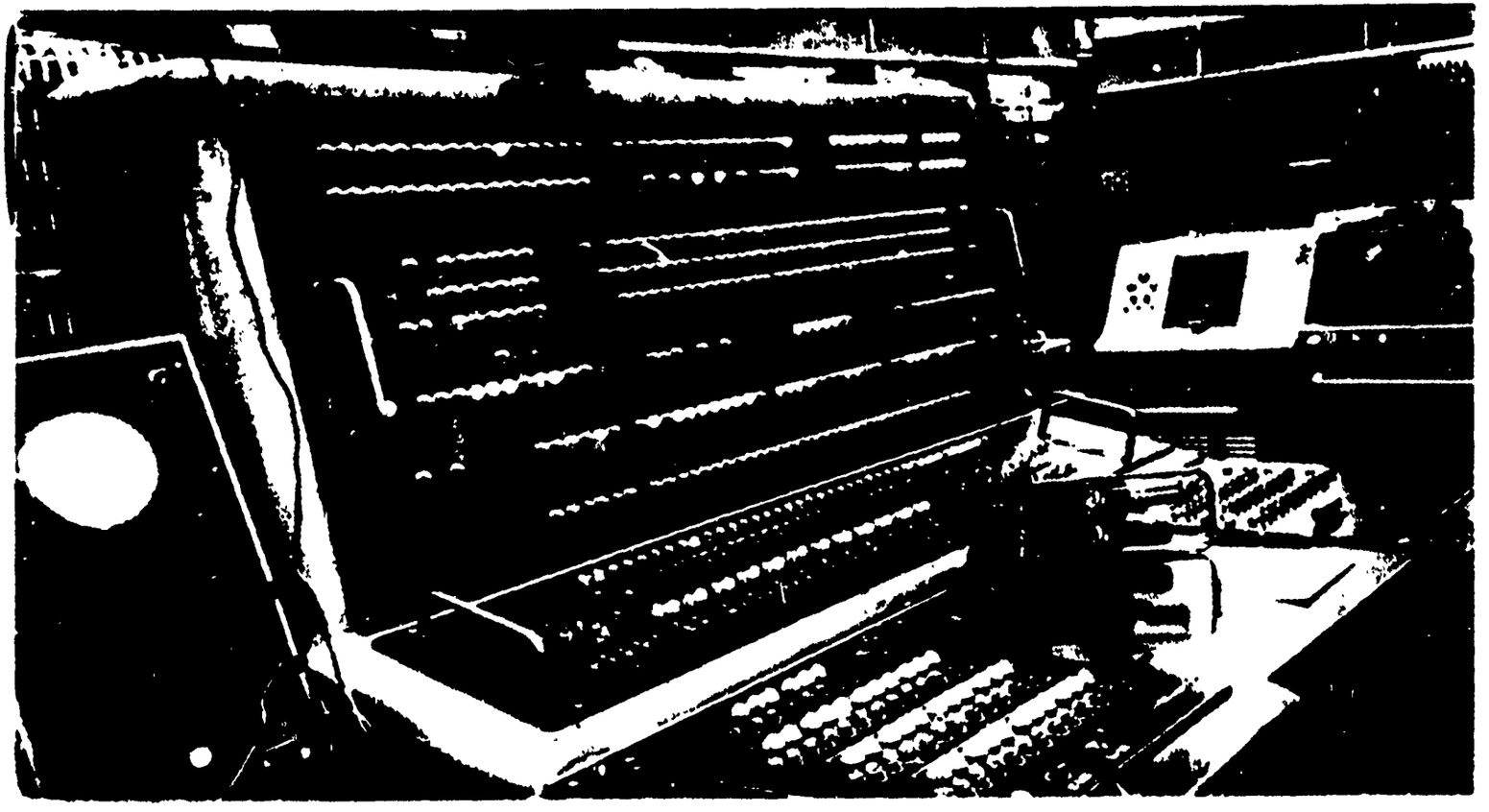
BESM-2 operating speed is 8000-10,000 opns/sec; the basic machine cycle is 10 μsec (a holdover from the BESM-1 design), while the store cycle time is 6 μsec. An addition requires 70 μsec (including four memory accesses) and multiplication and division take 230 μsec (including accesses).

BESM-2M

There are a number of machines labelled "BESM-2M" ("M" standing for "modified"). For the most part, these are probably local, in-house modifications to BESM-2 units. It is unlikely that they are prototype or developmental machines between BESM-2 and the BESM-3/BESM-4 models (see below).

The pictured machine appeared on the cover of the Latvian magazine Nauka i tekhnika (Science and Engineering) in February 1965. It is identified only as Latvian

*Different sources give different figures for the configuration of external storage units. These variations are probably accounted for by some changes to the production model over the design prototype (or prototypes) and by local modifications.



Believed to be BESM-2M

(00361P)

University's machine, which is known to be a BESM-2; however, this is quite obviously a modified version, so we surmise it to be an example of a BESM-2M.

M-20

The BESM machines are intended for scientific and engineering applications, while the M-20 is generally considered to be the "industrial" counterpart of the BESM-2. M-20 was designed by Lebedev at the Institute of Precise Mechanics and Computer Engineering and M. K. Sulim, then at the Moscow Calculating Machines Plant, one of the places where it was produced (there is indication that M-20 machines have been produced in several places, notably by NIISchetmash*).

The M-20, under development simultaneously with BESM-2, was introduced in 1959, at which time it is believed to have been already in production (thus placing the design completion time at about 1957). Lebedev and the design team were nominated for a Lenin Prize for their work on M-20 which, at the time of its announcement, was the Soviets' best machine.†

Unlike the BESM machines which are often used as examples of typical digital computers, very little has been published about the M-20. Pictures are rare, and (to our

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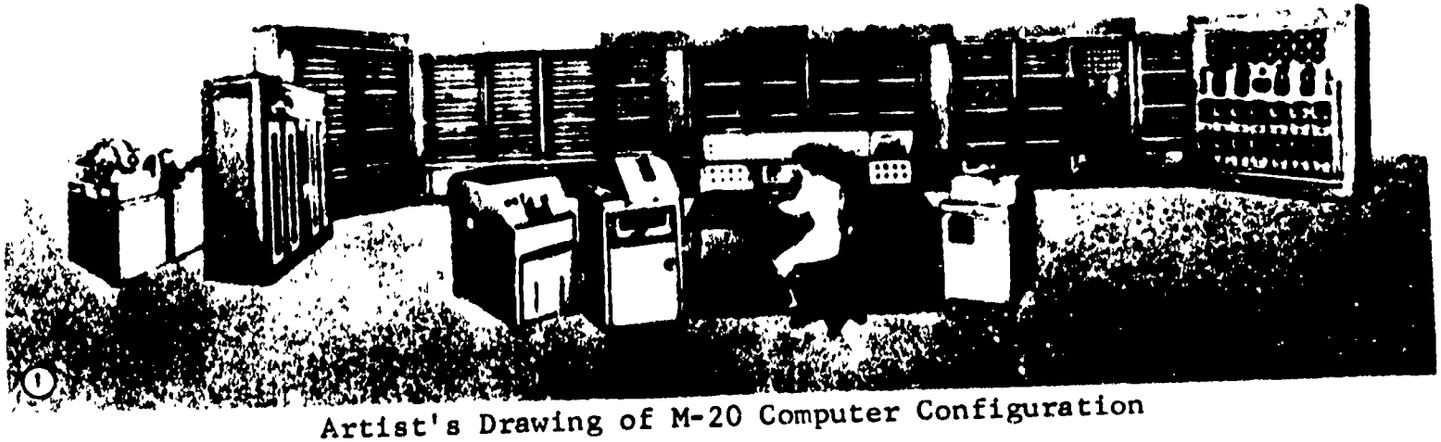
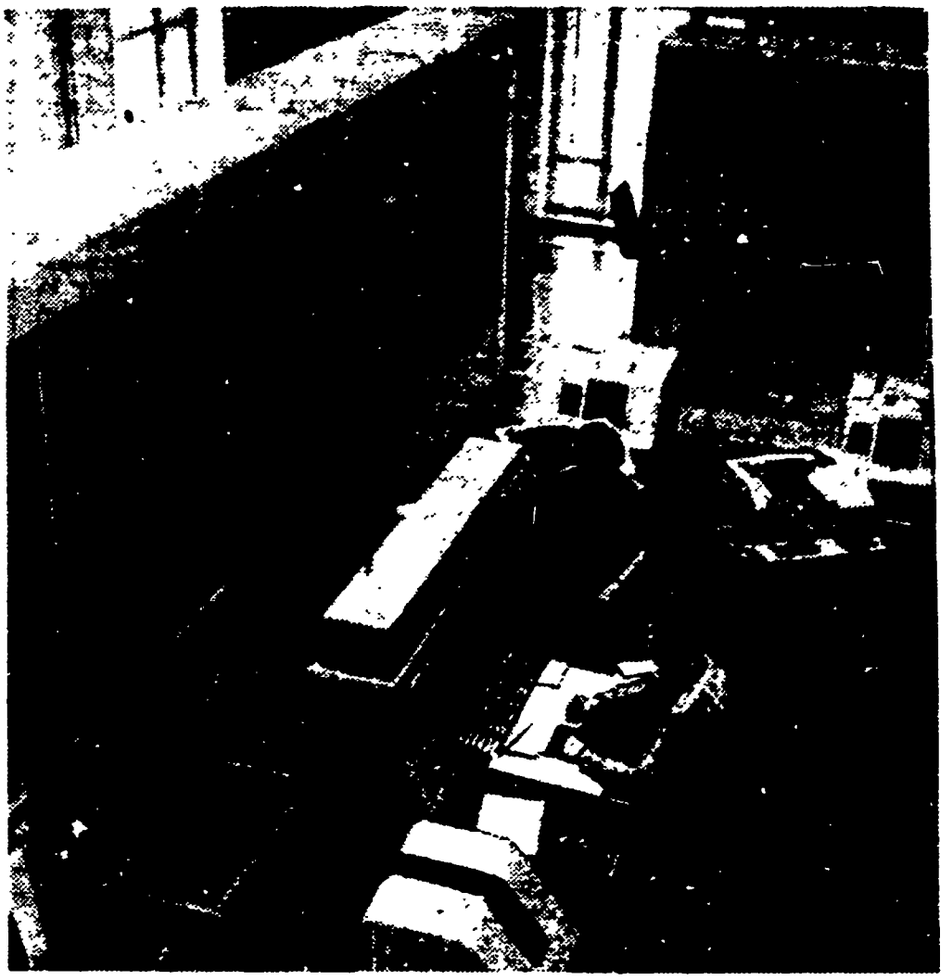
*Scientific Research Institute of Calculating Machine Construction, located in Moscow.

†The Prize was not given for the M-20 work on the grounds that it represented no advances in the state of the art when foreign technology was considered.



Artist's Drawing of M-20 Computer Configuration

(00822P)



M-20 Computer at Moscow State University

(01180P)

knowledge) no photograph has ever been explicitly identified as being of the M-20. The artist's sketch, reproduced here, is the only pictorial representation we have seen that is specifically identified as being of the M-20; it appeared in an automation and electronics encyclopedia published in 1965. A comparison of it with the second picture, noting especially the configuration and design of the peripheral gear, clearly indicates that the photograph is of the same machine. This photograph was published in the weekly economics newspaper Ekonomicheskaya Gazeta last October, where it was identified only as a computer at the Moscow State University Computer Center. The third picture, which we identify as an M-20 on the basis of an identical control console face, is taken from a 1963 picture book on the Science City in Novosibirsk (the original photograph is in color), where it is captioned: "In the Computer Center."

M-20 is capable of 20,000 opns/sec (as the "20" indicates).* It is a three-address, binary machine with 4096 45-bit words of core storage. It has both fixed and floating point operations. Cycle time is 6 μsec.

The M-20 has alphanumeric input capability via punchcards at a rate of 60 cards/min. Output is to a card punch

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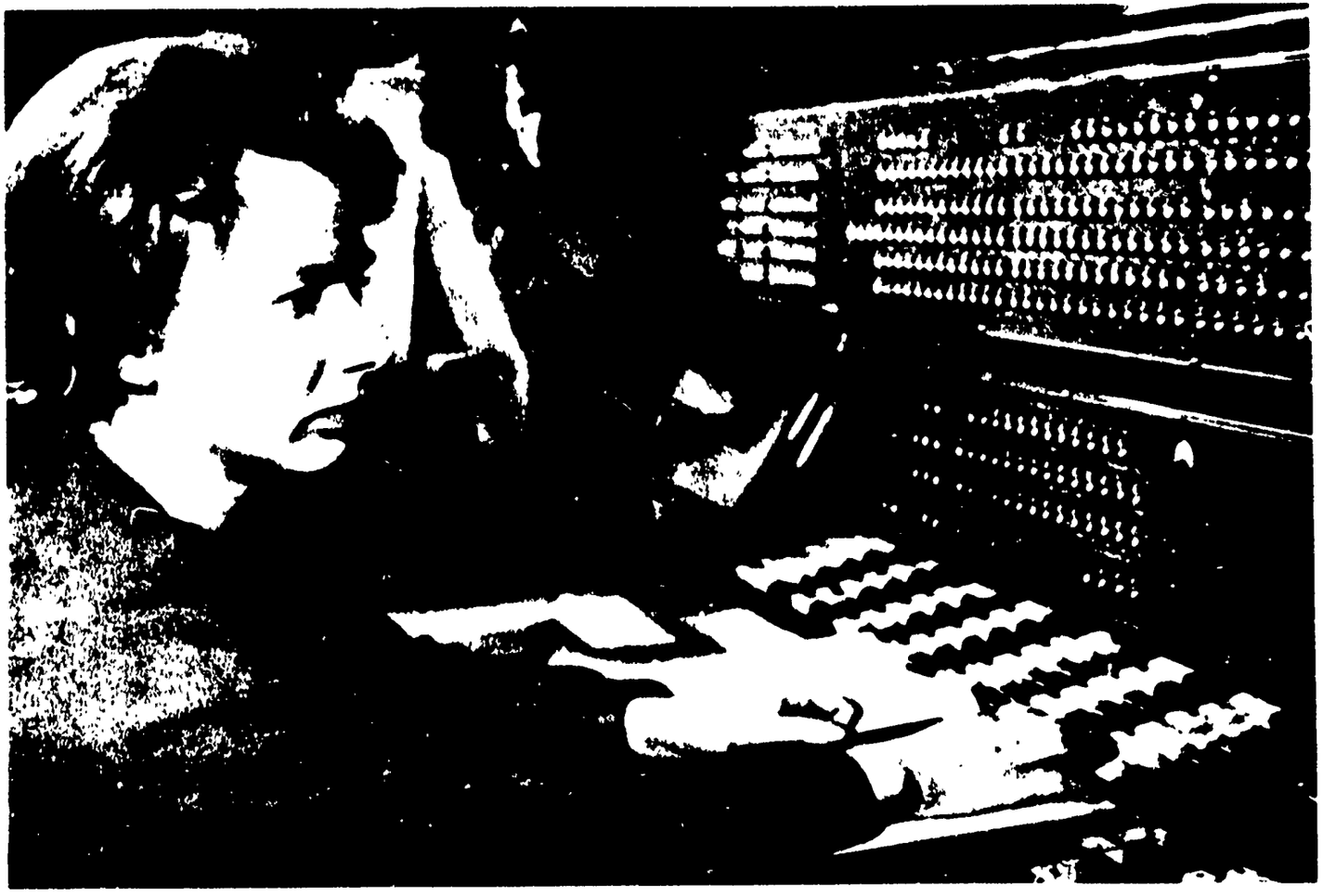
*The M-20, M-50, M-220 line should not be confused with the M-1, M-2, and M-3 series designed during the '50s by I. S. Bruk at the Institute of Electronic Control Computers. The latter are small- and medium-sized machines, and are not related to the larger M computers. Also, there is an MN series of computers, all of which are analog machines.



M-20 at Novosibirsk Science City

(01421P)

(at 30 cards/min) or to a 20-line/sec numeric printer.

Auxiliary storage is on three 4096-word drums and four 75,000-word tape units. Drum read/write speed is 13,900 characters/sec; tape read/write proceeds at a rate of 3000 characters/sec.

The M-20 has 4500 vacuum tubes and 35,000 diodes. It is physically quite large, occupying 370 m^2 of floor space. It is generally rated as somewnat below the capabilities of an IBM 7090.

Although the production of M-20 computers has probably been quite large (at least by Soviet standards), there has been some indication of poor reliability. One of the few detailed preventive maintenance schedules to appear in the Soviet literature deals with experience gained in maintaining two M-20 machines over a five-year period.* It mentions that there had been "refinements" made to the machines, which, together with a rigid preventive maintenance program, had "led to an increase in useful machine operating time for the M-20 to 7145 hours annually, or 19 hrs, 35 min per day on the average." An M-20 installed at the Institute of Cybernetics of the Ukrainian Academy of Sciences in Kiev was

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*M. T. Kobzar' and A. M. Smaglij, "Opyt ekspluatatsii i usovershenstvovanie elektronnoj tsifrovoj vychistel'noj mashiny M-20" ("Utilization Experience and Refinement of the M-20 Electronic Digital Computer"), in the collection Tsifrovaya vychislitel'naya tekhnika i programmirovanie (Digital Computer Engineering and Programming), No. 1, A. I. Kitov (ed.), "Sovetskce Radio," Moscow, 1966, pp. 87-102.

reported to be highly unreliable, with an average time-to-failure rate of only 15 minutes![*]

There have been reports of an M-50 computer under development, which would run at 50,000 opns/sec.[†] It is not known whether such a machine has ever been produced or not. An M-220, a transistorized version of M-20, also operating at 20,000 opns/sec, has been developed. It was the "official" transistorized version of M-20, as opposed to the BESM-4 which is the result of an "unofficial" design project (see below).

BESM-4 and BESM-4

While the M-220 was being developed according to plan as the official transistorized version of the M-20 (it is not known who had responsibility for this updating work), some young engineers and technicians were designing and building their own "unofficial" transistorized M-20. As reported in a rambling article in Pravda, February 14, 1966,

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[*] Yu. I. Krasnyj, "Use of a Computer in Forming an Optimal Variant of an Annual Plan for a Plant Geared to Individual-Job and Small-Lot Production," in Issue 20 of the Scientific Transactions of the Moscow Engineering-Economics Institute, Primenenie matematicheskikh metodov i novejshej vychislitel'noj tekhniki v planirovanii mashinostroitel'nogo proizvodstva (Use of Mathematical Methods and Innovations in Computer Technology in the Planning of Production Processes in the Machine Industry), "Mashinostroenie," Moscow, 1964, pp. 102-106; English abstract in Computer Technology, ATD Report P-65-50, Aerospace Technology Division, Library of Congress, Washington, D.C., July 13, 1965, p. 18.

[†] V. Czapla, "Digital Computers in the Soviet Union," Mathematik-Technik-Wirtschaft, No. 1, 1961, pp. 16-18 [an Austrian journal].

this so-called "initiative" machine eventually became the center of a bureaucratic squabble that was not resolved until a state commission, headed by Academician A. A. Dorodnitsyn, visited the unidentified plant where the new machine was being built in order to evaluate and test it.

It was determined that the young scientists' computer had some distinct advantages, such as its high productivity, compact physical design, low power requirements, simple logical structure, very high reliability, and relatively low cost. In short, the "unofficial" machine gained legitimacy, and its further design and development were taken over by Lebedev and the Institute of Precise Mechanics and Computer Engineering.

The machine was first called BESM-3, and soon went into production under the name BESM-4. There are reportedly some slight differences between the two, but essentially they are the prototype and production models of the same machine (although several BESM-3 machines were made). The BESM-4 is being widely used and apparently has been manufactured in large numbers.

Design of the M-220 was completed, apparently significantly behind schedule.* No details of its construction

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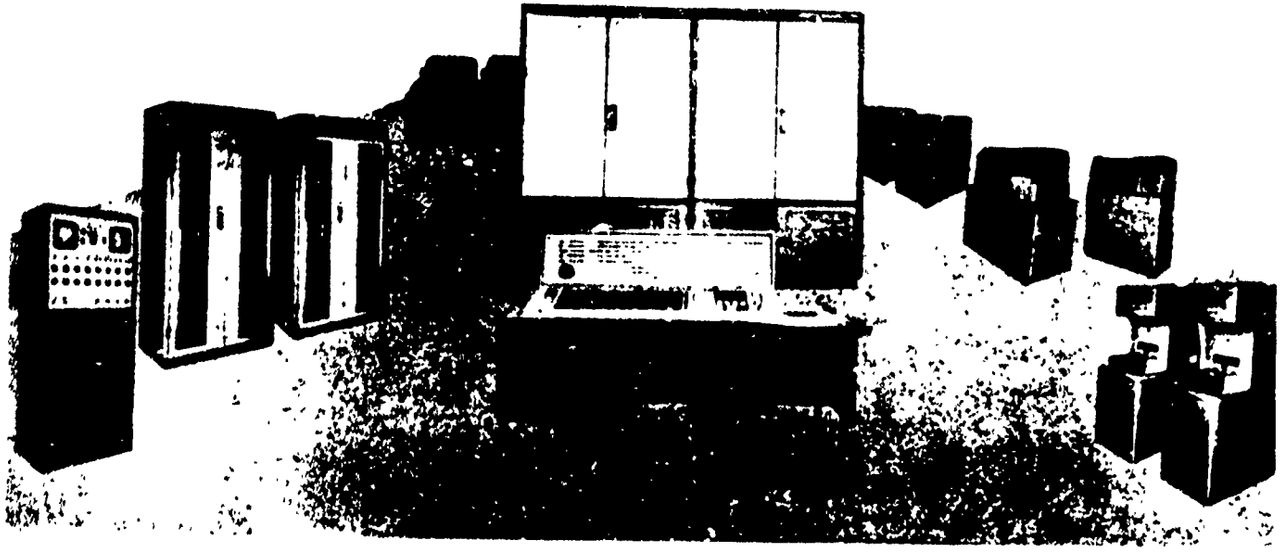
*This may be a somewhat simplified account of the development from M-20 to BESM-4 and M-220. Opposition to the "initiative" machine appears to have been centered around M. K. Sulim, who issued an order on March 30, 1964 (by which time the machine had been completed) prohibiting work on it. Sulim is the Deputy Chairman of the State Committee on Radioelectronics, and apparently was engaged in some sort of controversy with Lebedev over development of the transistorized M-20. Since Lebedev's design activities are probably somehow subordinate to the State Committee, Sulim would seem to have had the advantage. The



BESM-4 Computer

(01061P)

have been released, and we have seen no pictures of it, although apparently some units do exist.*

The first photograph of BESM-4 is taken from a design specifications brochure handed out last September at the Interorgtekhnika-66 Exhibit in Moscow's Sokol'niki Park. The second photo is of the BESM-4 unit on display at the Exhibit.

BESM-4 is a transistorized, 3-address, binary machine utilizing printed circuits throughout. It has hardware floating point; a floating-point add requires 47 μsec, a floating-point multiply 95 μsec, and a floating-point divide 152 μsec.

It has a core store of 8192 45-bit words with a 10-μsec access time. Its speed is 20,000 opns/sec. A typical configuration consists of four 16,384-word drums and drives for four or eight 1,000,000-word tapes.

Input via punchcards is at a rate of 700 cards/min; output is via punchcards at 50 cards/min, via papertape at

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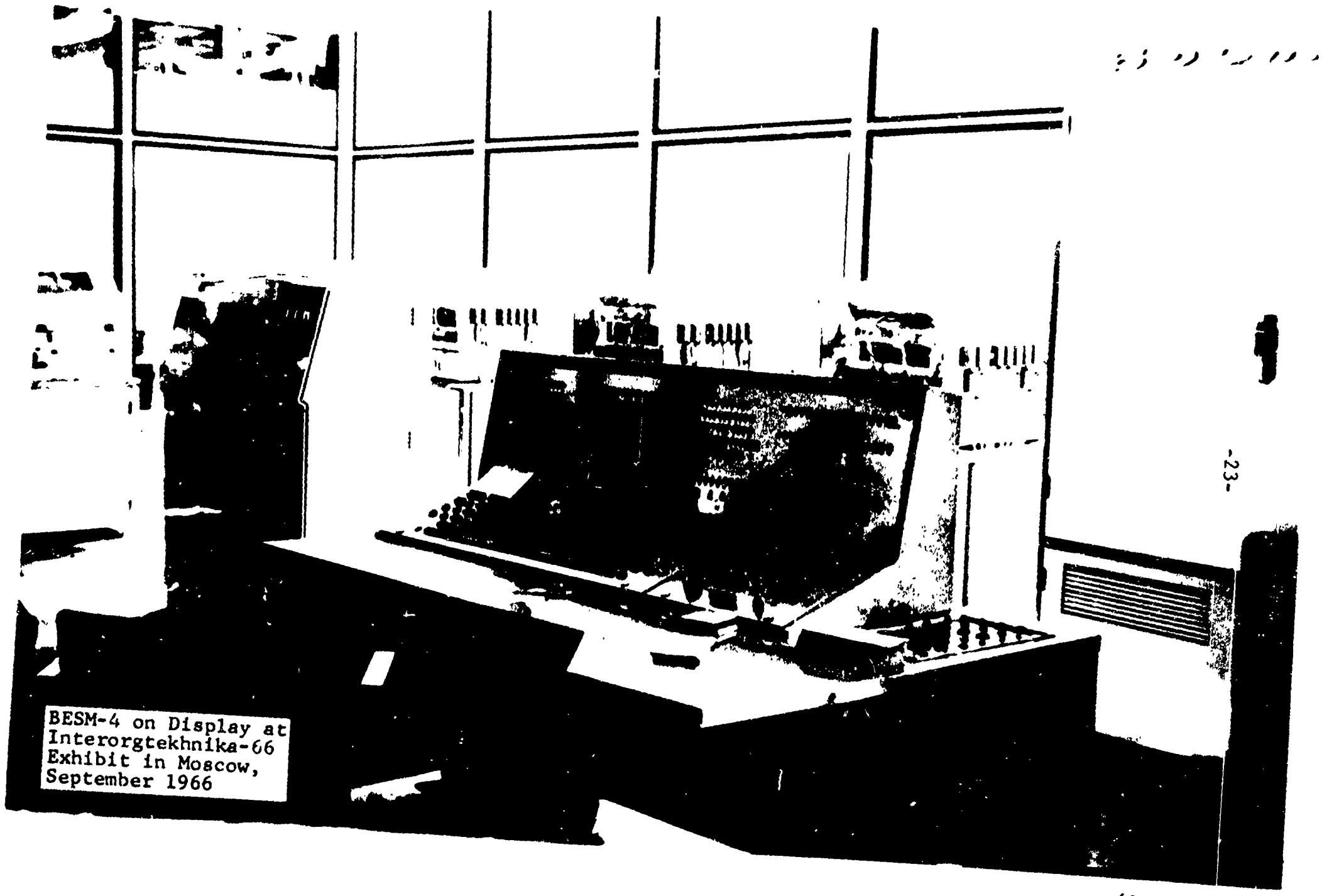
"initiative" machine thus may have been a subterfuge employed by Lebedev to present the State Commission with a fait accompli.

There is also some mention in the literature of a BESM-3M, which is probably an earlier name for the BESM-4, the production version.

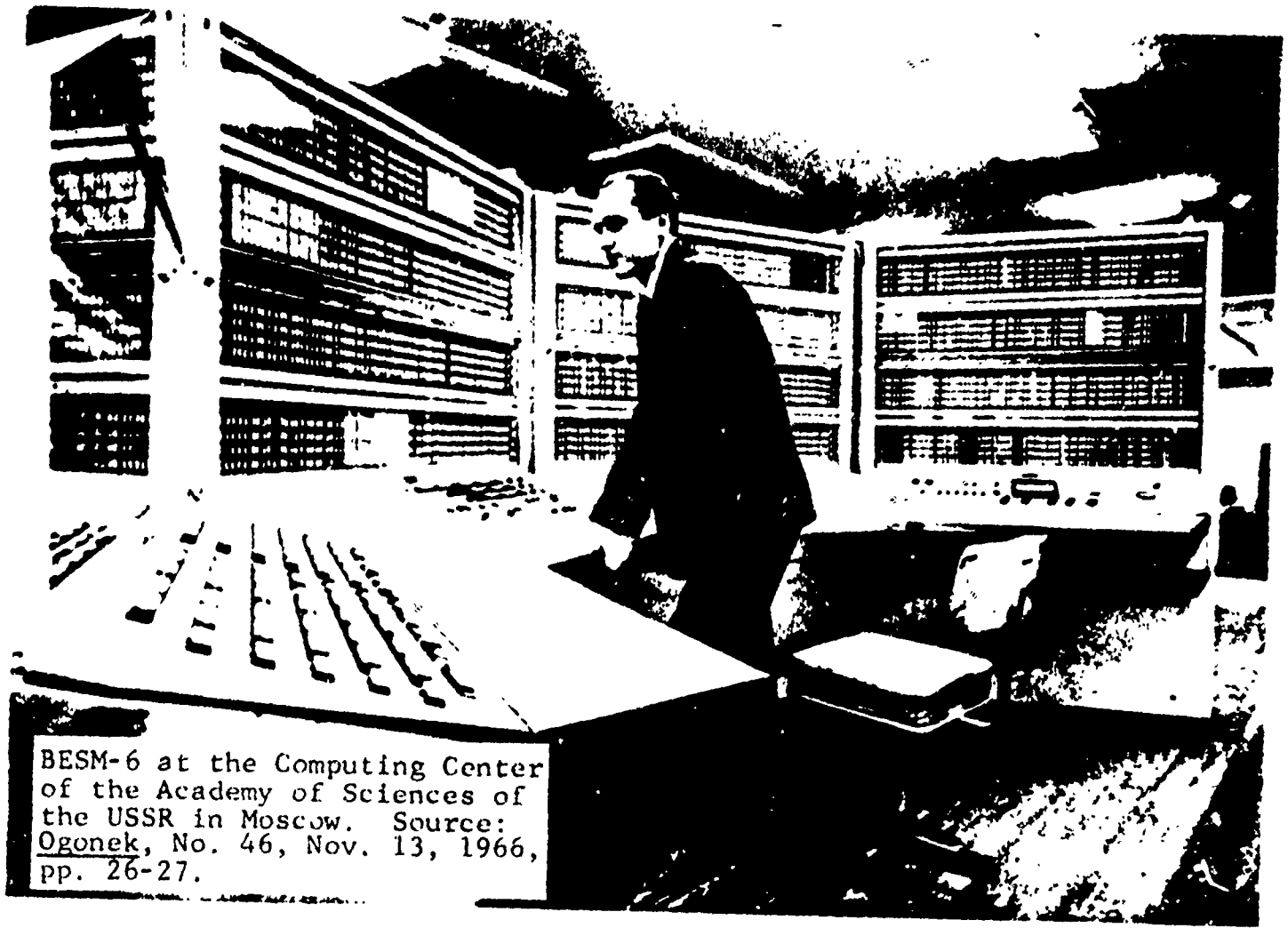
Based on the Pravda statement that Sulim's March 1964 order followed completion of the "initiative" machine and a mention last fall that a BESM-3 had been installed at the Computer Center of the Academy of Sciences for two years, we date these machines as having been designed (in the "initiative" model) in 1963, with BESM-4 going into production perhaps as early as the latter part of 1964.

*M-220 was listed as being in production in May 1965 in an article in the newspaper Sovetskaya Kirgiziya, May 5, 1965, p. 1.



BESM-4 on Display at Interorgtekhnika-66 Exhibit in Moscow, September 1966

(01044P)



BESM-6 at the Computing Center of the Academy of Sciences of the USSR in Moscow. Source: Ogonek, No. 46, Nov. 13, 1966, pp. 26-27.

(01392P)

20 rows/sec, or via printer at approximately 300 lines/min. It has alphanumeric capability.

BESM-6

The BESM-6 was featured in SC:RNI, Nos. 1 and 3, and readers are referred to those issues for details of its design and operation, and for several photographs of the machine, its peripheral equipment, and some of the people associated with it. The picture of the control console shown here is from the popular magazine Ogonek and was also published in SC:RNI, No. 3.

o Minsk-14
For Sale

C D R P T R A N S L A T I O N

"Rostsel'mash" Plant

[Translation of an advertisement headed "Zavod 'Rostsel'mash'" (English version above), in the newspaper Ekonomicheskaya gazeta (Economics Gazette), No. 16, April 1967, p. 47/1; translation by Pat Stephan, May 1, 1967.]

The "Rostsel'mash" [Rostov Agricultural Machines] Plant will sell or transfer on account a Minsk-14 ELECTRONIC COMPUTER (two address; with fixed point; 31-bit word-length; 3000-4000 opns/sec; capacity of internal memory--2048 words; external storage capacity--256,000 words; power requirements--up to 27 kilowatts; space requirements--60 m^2).

Apply: Rostov-na-Donu, "Rostsel'mash," Computer Center, tel. 77-6153.

File No. 01434A

o 18 Computers in
Latvian SSR

o Backwardness of
Data Preparation
Techniques

C D R P T R A N S L A T I O N

Electronics in the Administration of the National Economy

[Summary of extracts from an article by E. Abolin' and R. Soms in the journal Kommunist Sovetskoj Latvii (Communist of Soviet Latvia), No. 10, October 1966, pp. 15-20;* prepared by Wade Holland, April 25, 1967.]

There are currently 18 digital computers installed in the Latvian SSR, including a BESM machine at the Computer Center at Latvia State University[+] and a Ural-11 at the Computer Center of the Central Statistical Administration of the Latvian SSR.

The BESM at the University has been extensively used in developing and gaining experience with systems of operational production planning. Systems of a type developed on the basis of work at the University are now being used in various Latvian factories.

The Central Statistical Administration is concerned with problems of digesting economics data and is working on the development of the State Network of Computer Centers. It has been found that there exists at the present time a disparity between the modern high-speed computer, capable of tens of thousands of operations per second, and the backward techniques used for data preparation and encoding;

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*This summary was prepared from JPRS 39269, a complete translation of the article; available from the Clearinghouse for Federal Scientific and Technical Information of the U.S. Department of Commerce.

[+]This is probably the BESM-2M pictured in SC:RNI, this issue, p. 12.

studies indicate that 70-100 hours of manual processing of economics data are required for every hour of machine processing time

o Design of City-Service
Computer Center

o Responsibilities for
Computerizing Economy

C D R P T R A N S L A T I O N

Cybernetics in City Engineering Departments

[Translation of extracts from pages 75-77 of the book Kibernetika v inzhenernom oborudovanii gorodov (English version above), by Anatolij P. Dekhtyarev, Izdatel'stvo "Budivel'nik," Kiev, 1966; translation by Pat Stephan, March 7, 1967.]

Cybernetic systems for city engineering departments are unified complexes consisting mainly of systems used in optimizing technological processes in industry.

Entire systems of nodes, controlled from a single center, constitute the main elements of cybernetic approaches to fulfilling the function of optimizing enterprise operations.

Cybernetics applied to the engineering departments of a typical city is characterized as follows:

Number of control points--3000.

Operating time (yearly)--8000 hrs.

Sequences of input information from various sources (electrical works, water works, gas, heating, etc.).

Sequences of processed data and feedback commands.

Type of computer--semiconductor control machine on the Strela or UMSHN design principle.

Number of computers--2.

Number of basic data processing and feedback output complexes--2.

Cost of entire system--10 million rubles.

Payback period--7.8 years.

Decrease in operating expenditures realized by introducing cybernetic system--25%.

To accelerate the actual implementation of cybernetic engineering departments at the city level, it is desirable that in future planning maximum use be made of cybernetic devices designed for and operating in industrial systems. For the purpose of solving basic problems of optimal planning and for extensive introduction of computer technology into the national economy, the Central Economico-Mathematical Institute (TsEMI) of the Academy of Sciences of the USSR, the Main Computer Center of Gosplan of the USSR, and the Scientific Research Institute on the Design of Computer Centers and Systems of Economic Information (of the Central Statistical Administration) of the USSR have already been created. TsEMI has been charged with developing the scientific principles for a unified system of optimal planning and control. In order to carry out appropriate experimental work around the country and to provide methodological supervision, the Main Computer Center of Gosplan must develop a unified system and introduce it into the national economy. The Scientific Research Institute of the Central Statistical Administration of the USSR has been called upon to provide for the completion of planned projects and to solve statistical problems as applied to the unified state network of computer centers.

The Main Administration on the Introduction of Computer Technology into the National Economy has been created under the State Committee on Science and Technology of the USSR to supervise the complex of projects.

An Interdepartmental Scientific Council on the Introduction of Mathematical Methods and Computer Technology in the National Economy has been organized under the Committee. The Council has seven sections: economic information; planning and control of the national economy; management of industrial enterprises; control of technological processes; processing of scientific information; automation of engineering control projects; and information-control systems hardware.

The activity of the computer organizations is at three levels. The first level encompasses usual computer complexes at industrial enterprises, scientific-research institutes, design organizations, and higher educational institutions; the second, group computer centers connected with the activity of the region as a whole and its computer complexes; the third, head computer centers.

The participation of government agencies involved in the supervision of computer technology in fostering the introduction of cybernetic devices in industrial production will help create qualitative cybernetic systems.

File No. 01039B
TD153,D32k

o Characteristics, Costs of Several Computers

o Industrial Dynamic Planning Methods

C D R P T R A N S L A T I O N

Operational Production Planning in a Machine-Construction Factory

[Translation of Tables 6 and 12 from the book Operativnoe planirovanie proizvodstva na mashinostroitel'nom zavode (English version above), V. A. Letenko (ed.), Mashinostroenie, Moscow, 1966, pp. 316-317, 346-347; translation by Pat Stephan and Wade Holland, April 17, 1967.]

Table 6

ELECTRONIC COMPUTERS

Type	Typical Machine	Characteristics	Cost (rubles)	Comment
Small	Ural-1*	100 opns/sec except division (division, 25 opns/sec). Decimal and octal representation for I/O; binary for data and instructions internally. Storage capacity: 10,000 words on punched papertape and 40,000 36-bit words on magnetic tape; 1024 or 2048 words of magnetic drum immediate-access storage.	50,000	For solving mathematical and logic problems
	Minsk-1	2000-3000 opns/sec. Same number representation as the Ural-1. Storage capacity: immediate-access unit, 1024 31-bit words; 64,000 words on magnetic tape.	45,000	For solving mathematical and logic problems
Medium	Ural-2	5000-6000 opns/sec. Decimal representation for input and printer output; octal for instructions; binary for data and instructions internally. Storage capacity: magnetic tape, 100,000 words or 200,000 instructions; ferrite store, 2048 40-bit or 4096 20-bit words.	170,000	For solving mathematical and logic problems
	Minsk-2	8000 opns/sec. Same number representation as Ural-2. Storage capacity: magnetic tape, 400,000 37-bit words; immediate-access store, 4096 37-bit words.	170,000	For solving mathematical and logic problems

*The Ural-1 machine has now been taken out of production but is still in operation at a number of installations.

Table 6 -continued

Type	Typical Machine	Characteristics	Cost (rubles)	Comment
Medium (cont.)	Minsk-22 (modified Minsk-2)	Alphanumeric I/O, output to punch-cards, etc.	------	For accounting, production planning, and production control
	Ural-4	5000-6000 opns/sec. Storage capacity: magnetic tape, 5,000,000 40-bit words; ferrite store, 2048 40-bit words, 20,480 decimal digits, 12,288 alpha-numeric characters. Alphanumeric printer. Input is via telegraph tape and punchcards.	220,000	Solution of a wide class of mathematical problems

Table 12

COMPUTERIZED DYNAMIC-PLANNING EVALUATIONS

Computerized Operation	*	Mass and Large-Scale Serial Production	Serial Production	Single-Unit and Small-Scale Production
--1-- Evaluation of power consumption and production volume capacity	Tasks	Determine maximum possible system output		
	Meth.	Linear programming		Orders' portfolio grand-total calculation
	Orgs.	Latvian Sovnarkhoz Laboratory, LIEI, TsNIITU		
--2-- Temporal distribution of orders (yearly), including plan fulfillment for organizational technology improvements and equipment utilization	Tasks	-----	Time/capacity evaluation of equipment utilization	
	Meth.	-----	Linear programming	
	Orgs.	-----	-----	TsNIITU
--3-- Shop and section production programs (quarterly, monthly)	Tasks	Modularization, detailed planning including changes to production lots	Evaluation of nominal system	Matching orders to plant capacities
	Meth.	Matrix algebra, logical programming	Methods for evaluating piece-work or day-unit work	Method for determining minimum progress,...,etc.
	Orgs.	TsNIITU, NIIAvtoprom, MIEI	Latvian Sovnarkhoz Laboratory, TsNIITU	MIEI, TsNIITU

Computerized Operation	*	Mass and Large-Scale Serial Production	Serial Production	Single-Unit and Small-Scale Production
--a-- Calendar plan quotas	Tasks	Evaluate production batches, cycles, lots	Evaluate production batches, cycles, surpluses, lots	Evaluate production cycles, advance work
	Meth.	Differential calculus, logical programming, dynamic modeling		
	Orgs.	LPI, TsNIITU, MIEI	LPI, TsNIITU, MIEI	
--b-- Intershop intake/outgo calendar planning	Tasks	Establish uniform intake periods, detailed operational intake/outgo plans	-----	Establish decade intake/outgo plan for each order
	Meth.	Linear and logical programming	-----	Heuristic-combinatorial method
	Orgs.	TsNIITU	-----	TsNIITU
--b-- Sectional calendar plans	Tasks	Compile assembly-line worker-distribution plans, calendar schedules for series units	Secure machine-tool parts. Card-index monitoring	Compile calendar schedules
	Meth.	Combinatorial methods, dynamic modeling, linear programming	NEVZ	Combinatorial methods, modeling, linear programming
	Orgs.	Institute of Cybernetics of Ukrainian SSR Academy of Sciences, TsNIITU	NEVZ, TsNIITU	TsNIITU, MIEI

*Tasks--Actual dynamic production planning project tasks.
Meth.--Computerized solution methods employed.
Orgs.--Organizations responsible for development and introduction of Methods.

Abbreviations
LIEI--Leningrad Engineering-Economics Institute
TsNIITU--Central Scientific Research Institute of Control Organization and Technology
NIIAvtoprom--Scientific Research Institute of the Automobile Industry
MIEI--Moscow Engineering-Economics Institute
LPI--Leningrad Polytechnic Institute
NEVZ--Novocherkassk Electric Locomotive Building Plant

o Vil'nyus Calculators
Unfit for Use

C D R P T R A N S L A T I O N

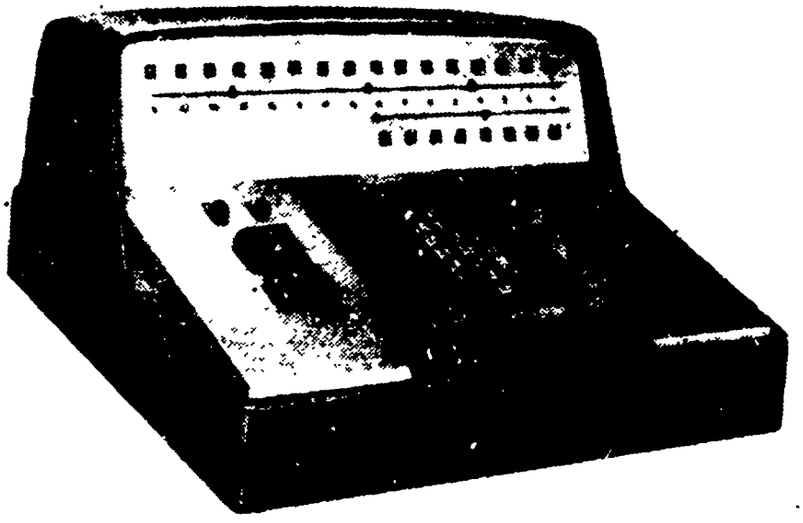
The Artist Comments on Letters

[Translation of an item in the section "Pis'ma kommentiruet khudozhnik" (English version above), in which a cartoonist illustrates letters from readers, in Izvestiya, April 18, 1967, p. 4; this letter is by L. Semenov, Doctor of Technical Sciences, and the artist is Yu. Ivanova; translation by Pat Stephan, April 24, 1967.]

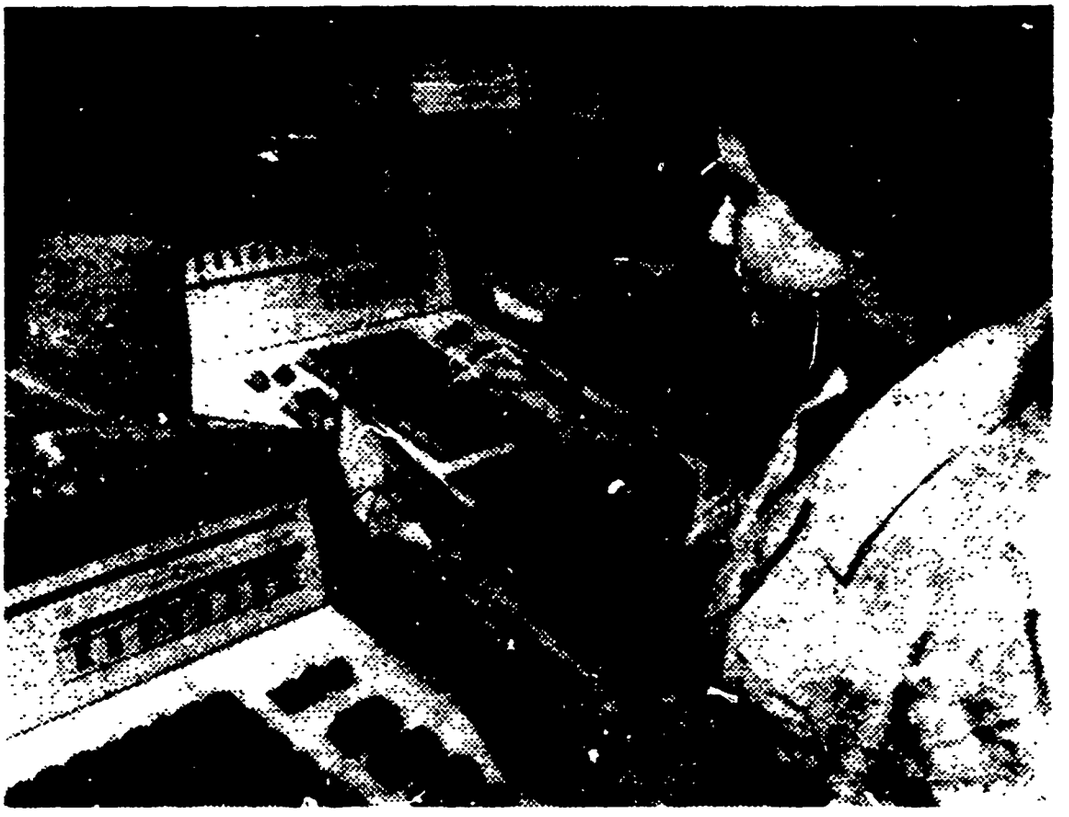
The Rostov Engineering-Construction Institute has received five "Vil'nyus" full-keyboard computers. All of these machines have turned out to be unfit for use. Twice mechanics from the factory have come to repair and adjust them and to change parts, but each time a day or two later the machines again broke down.

[Shown above is the artist's illustration for the above letter. The device is labelled "COMPUTER." Actual photographs of the "Vil'nyus" are shown on the following page.]

File No. 01420A
Vil'nyus photos: File Nos. 00819P
01154P



Vil'nyus Electronic Calculator



Vil'nyus Production Check-out

C D R P T R A N S L A T I O N

Guide to Computer Technology

[Summary of a book review entitled "Spravochnik po vychislitel'noj tekhnike" (English version above), in the journal Mekhanizatsiya i avtomatizatsiya proizvodstva (Mechanization and Automation of Production), No. 11, November 1966, pp. 57-58; translation and summary by Wade Holland, January 23, 1967.]

The article is a review of a Czech book, published in 1965, entitled Guide to Computer Technology (Spravochnik po vychislitel'noj tekhnike [Czech title not given] by Yan Neshitskij [transliterated from the Cyrillic]. The book is a summary and overview of computational technology in Czechoslovakia.

All digital computers in use in Czechoslovakia as of December 31, 1962 are listed in the book; the total number of machines at that time was 22 (this table is not reproduced in the review). At the present time, however [1965?], there are more than 200 computers in Czechoslovakia.

The bulk of the review is taken up with a brief summary of each of the 12 sections of the book.

File No. 01423A

Electronic examiner in use during geography lesson at Moscow High School No. 325.
Source: Pravda, April 2, 1967, p.3.

(File No. 01422P)

o Personalities Doing
Optimal-Plan
Modeling

C D R P T R A N S L A T I O N

Optimal Material Balance in the National Economy

[Translation of an excerpt from the book Optimal'nyj material'nyj balans narodnogo khozyajstva (English version above), by L. M. Dudkin, Izdatel'stvo "Ekonomika," Moscow, 1966, p. 24; translation by Pat Stephan, April 13, 1967.]

...a number of...economists and mathematicians are working in the area of the development of optimal planning models and on related problems. V. A. Volkonskij, Yu. N. Gavrilets, A. I. Katsenelinbojgen, V. V. Kossov, V. A. Mash, B. N. Mikhalevskij, Yu. V. Ovsienko, Yu. M. Tikhomirov, E. Yu. Faerman, and others are working at TsEMI [Central Economics-Mathematics Institute] of the Academy of Sciences of the USSR on the creation of different variants of optimal-plan models; B. M. Smekhov is working at MINKh [Moscow Institute of the National Economy]; E. B. Ershov, at NIEI [Scientific Research Economics Institute] of Gosplan USSR; V. F. Pugachev and N. I. Kovalev, at Gosplan USSR; and V. M. Makarov and N. F. Shatilov, at the Siberian Department of the Academy of Sciences of the USSR.

An article by D. B. Yudin and E. G. Gol'shtejn* is among the works on optimal planning models. A number of

*D. B. Yudin and E. G. Gol'shtejn, "On One Method of Quantitative Analysis of Simplified Economic Models," in Primenenie matematiki v ekonomicheskikh issledovaniyakh (The Application of Mathematics in Economics Research), Vol. 2, Sotsekgiz, Moscow, 1961.

the works of Academician V. S. Nemchinov,* the doctoral dissertation of Corresponding Member of the Academy of Sciences of the USSR A. G. Aganbegyan, and A. L. Lur'e's book** are devoted to general theoretical problems of constructing mathematical models of an optimal plan. The works of Professor V. V. Novozhilov, Corresponding Member of the Academy of Sciences of the USSR A. N. Efimov, and Academicians V. M. Glushkov and N. P. Fedorenko indicate the feasibility and necessity of treating the problem of compiling a national economic plan as an optimal problem.

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*V. S. Nemchinov, Ekonomiko-matematicheskie metody i modeli (Economico-Mathematical Methods and Models), Sotsekgiz, Moscow, 1962.

_____, "Razvitie mezhotraslevogo balansa v model' narodnokhozyajstvennogo plana," Nauchnoe soveshchanie po problemam mezhotraslevogo balansa ("Development of an Intersectorial Balance for a Model of the National Economic Plan," Scientific Conference on the Problems of the Intersectorial Balance), Scientific Research Economics Institute of Gosplan USSR, Moscow, 1963.

_____, O dal'nejshem sovershenstvovanii planirovaniya i upravleniya narodnym khozyajstvom (On the Further Improvement of Planning and Control of the National Economy), 2nd ed., "Ekonomika," Moscow, 1965.

_____, "Models of National Economic Planning," Voprosy ekonomiki (Problems of Economics), No. 7, 1964.

**A. L. Lur'e, O matematicheskikh metodakh resheniya zadach na optimum pri planirovanii sotsialisticheskogo khozyajstva (On Mathematical Methods of Solving Optimum Problems in Planning a Socialist Economy), "Nauka," Moscow, 1964.

Semiconductor Manufacture at Leningrad "Svetlana" Plant
Source: Econ. Gaz., No. 17, April 1967, p.16.

(File No. 01447P)

o Tikhonov, Bruevich
Honored

C D R P T R A N S L A T I O N

Honoring Scientists

[Translation of two sections of an article entitled "Nagrazhdeniya uchenykh" (English version above), in the journal Vestnik Akademii nauk SSSR (Journal of the Academy of Sciences of the USSR), No. 1, 1967, pp. 141-142; translation by Pat Stephan, April 28, 1967.]

By a decree of October 29, 1966, the Presidium of the Supreme Soviet of the USSR has awarded Academician A. N. Tikhonov the Order of Lenin for great services in the development of the mathematical sciences and in connection with his 60th birthday.

A. N. Tikhonov is the founder of an important mathematical school. His outstanding works in various areas of mathematics--abstract topology, functional analysis, theory of differential equations, mathematical physics, and computational mathematics--have received worldwide recognition.

The breadth and scope characteristic of the scientist's research make it possible to pave new paths both in abstract and applied areas of mathematics and to find simple solutions to complex problems. A distinguishing characteristic of A. N. Tikhonov's scientific activity is the close link between theoretical research and practical problems, the transfer of solution methods proposed by him to computer algorithms.

A. N. Tikhonov has played a large role in the application of the methods of computational mathematics and mathematical physics to the solution of large new technological problems.

As emphasized in the welcoming address at the Presidium of the Academy of Sciences of the USSR, the scientist successfully combines fruitful scientific and pedagogical activity with scientific organizational and social work. One of the active members of the Department of Mathematics of the Academy of Sciences of the USSR, A. N. Tikhonov makes a great contribution to the coordination of scientific research work in our country.

* * *

By a decree of the Presidium of the Supreme Soviet of the USSR of November 12, 1966, Academician N. G. Bruevich was awarded the Red Banner Order of Labor for services in the development of science and in connection with his 70th birthday.

A prominent scientist in the area of the theory of machines, mechanisms, and precise mechanics, N. G. Bruevich is the author of more than 100 scientific works which have important theoretical and practical significance and which have received wide recognition in our country and abroad.

N. G. Bruevich has worked out basic problems of the kinematics and dynamics of complex plane and spatial mechanisms. He is one of the originators of precision and machine and instrument reliability theory, and also of a school of Soviet specialists in this area.

Academician A. N. Tikhonov

Academician N. G. Bruevich

Important research connected with cybernetics, computer engineering, and automation of intellectual labor in the area of machine building has been conducted in recent years under N. G. Bruevich's leadership.

For many years, N. G. Bruevich was involved with administrative work in the Academy of Sciences of the USSR--in particular, from 1943-49 when he occupied the post of Academician-Secretary of the Academy.

The scientist gives considerable attention to pedagogical activity, and a large number of highly qualified specialists have been trained by him over a period of many years.

File No. 01430A
Photos: File No. 01410P

ARTICLES AND PHOTOGRAPHS IN THE SOVIET PRESS

This section contains separate, annotated listings of the articles and photographs appearing in the Soviet popular press and dealing with cybernetics and computer technology. The listings are arranged chronologically by newspaper. Each entry briefly describes or abstracts the item, followed by the publication date, page number, and transliterated headline (where applicable). Any information available on translation of the item is carried in square brackets.

This issue covers Pravda, Izvestiya, Ekonomicheskaya Gazeta (Economics Gazette, a weekly paper), and Moscow News (a weekly English-language paper) for April 1967.

PRAVDA--ARTICLES

A101. When Tartu University received a new, more powerful computer, it gave its old Ural-4 to the Nyoskaya Village High School where special classes in mathematics, physics, agrochemistry, and the mechanization of agriculture are given (April 1, 1967, p. 4, "Vychislitel'nyj tsentr v shkole").

A102. Ferrous metallurgical enterprises in the Ukraine have planned an extensive program of organizational and technical measures to be implemented this year. In particular, the further introduction of automation into metallurgy is planned (April 2, 1967, p. 1, "Avtomatika na domennykh pechakh").

A103. The inability of man to cope with the tremendous complexity and volume of optimal planning calculations is emphasized. On the other hand, the choice of variants in optimal planning problems is too large for even the fastest computer to handle. The Ministry of Instrument Building, Means of Automation, and Control Systems has presented scientists with the problem of freeing planners from tiresome calculations while speeding up the computer. Experiments conducted in the Central Scientific Research Institute of

PRAVDA--ARTICLES (Cont.)

Complex Automation have yielded good results. Scientists and engineers of the computer department, together with workers of the First Moscow Watch Plant, have developed economico-mathematical methods of planning using computers. Some of these methods are described (April 2, 1967, p. 2, "Ekonomicheskoe obrazovanie mashin").

A104. The first laboratory on the scientific organization of labor in a higher school of the USSR has been opened at Tomsk Polytechnical Institute. Professor A. A. Vorob'ev has been named head of the laboratory (April 4, 1967, p. 4, "Otovsyudu").

A105. The Ministry of Ferrous Metallurgy of the USSR adopted a resolution on the creation of an information-computer center this year. The center will keep track of the daily operation of the metallurgical plants of the country (April 5, 1967, p. 6, "Sovetuet mashina"; see also, Izvestiya, April 5, 1967, p. 4, "Tol'ko fakty").

A106. The Committee of Standards, Measures, and Measuring Devices under the Council of Ministers of the USSR has adopted a mark of quality which will be awarded for a period of from one to three years to products of high quality which exceed state standard specifications (April 8, 1967, p. 4, "Znak kachestva"; see also, Izvestiya, April 8, 1967, p. 4, "Priznanie kachestva").

A107. Report on visit to three wholesale trade stores in Riga. "Latvelektroradiosnabsbyta" is a specialized store where such things as diodes and triodes are sold. The "Nauka" wholesale store sells various instruments, computing-analytic machines, and other hardware to industrial, research, and educational institutions. The 14 such stores in the Latvian SSR and 120 in the USSR (with 226 planned by the end of the year) have been organized to improve the system of material and technical supply (April 9, 1967, p. 2, "Magaziny dlya zavodov").

PRAVDA--ARTICLES (Cont.)

A108. The All-Union Scientific Research Institute on Electric Drive has developed the "Sever" gas-cutting automaton with photoelectric and programmed control (April 9, 1967, p. 3, "Novosti nauki i tekhniki").

A109. Editorial calls for more attention to and improvement of scientific laboratories located in plants. For example, wages of workers in the scientific centers of enterprises must be raised to keep from losing scientists to institutes where much more is paid for the same kind of work (April 13, 1967, p. 1, "Nauchnyj tsekh zavoda").

A110. Academician A. Berg stresses the importance of scientific fiction and calls for more work in this area. He cites a recent book dealing with quantum electronics as a good example of successful scientific fiction. Berg points out that even a popular book such as Science and Mankind (Nauka i chelovechestvo), to which he was a contributor, is intended for a relatively small audience. What is needed is literature addressed to the masses relating not only to factual information but also to investigating the psychology of scientific creativity, the processes of thought, etc. (April 16, 1967, p. 3, "Literatura, nauka, zhizn'").

A111. The work of the Scientific Research Institute of the Tire Industry under the Ministry of the Petroleum Refining and Petrochemical Industry of the USSR is described. An electronic computer occupying a large room is used to model vulcanization processes (April 19, 1967, p. 3, "Shelest shin").

A112. By a decree of the Supreme Soviet of the USSR of April 19, 1967, the Order of Lenin was awarded to several scientific institutes in the Academy of Sciences of the USSR. The Institute of Applied Mathematics was awarded the order for its

PRAVDA--ARTICLES (Cont.)

great services in the area of computer and applied mathematics and the training of highly qualified scientific cadres. The V. A. Steklov Mathematics Institute received an award for its great successes in the development of mathematical sciences and the training of highly qualified specialists-mathematicians (April 20, 1967, p. 2, "Nagrady Rodiny--nauchnym institutam"; see also, Izvestiya, April 21, 1967, p. 1, "Vysokie nagrady Rodiny").

A113. Lenin Prize laureates in the area of science and technology for 1967 include two matematicians, Yu. I. Manin and S. P. Novikov, of the V. A. Steklov Mathematics Institute (April 22, 1967, p. 1, "V TsK KPSS i Sovete ministrov SSSR" see also, Izvestiya, April 22, 1967, p. 2, "Pozdravlyaem, tovarishchi laureaty!").

A114. Academician M. Keldysh, Chairman of the Committee on Lenin and State Prizes in the Area of Science and Technology, describes the work of the Lenin Prize laureates (April 22, 1967, p. 2, "Shagi progressa").

A115. Construction of a "palace of science" has begun in Tashkent, the capital of the Uzbek SSR. The complex will include large and small conference halls and a large number of auditoriums for sectional scientific forums (April 26, 1967, p. 6, "Dvorets nauki").

A116. Vice President of the Academy of Sciences of the USSR, Mikhail Dmitrievich Millionshchikov, has been awarded the title of hero of Socialist Labor for outstanding achievements in the area of mechanics, nuclear physics, and energetics, and for fruitful scientific organizational work and great services in training highly qualified scientific cadres (April 28, 1967, p. 2, "Ukaz Prezidiuma Verkhovnogo Soveta SSSR"; see also, Izvestiya, April 28, 1967, p. 4, same title).

PRAVDA--ARTICLES (Cont.)

A117. For achievements in the development of science and the introduction of scientific achievements into the national economy, the Presidium of the Supreme Soviet of the USSR awarded orders and medals of the USSR to 498 scientific workers. The number receiving each kind of honor awarded is listed (April 28, 1967, p. 2, "Vysokie nagrady"; see also, Izvestiya, April 28, 1967, p. 4, "V Prezidiume Verkhovnogo Soveta SSSR").

A118. Five are awarded the title of Hero of Socialist Labor for their work in the organization and construction of the Siberian Department of the Academy of Sciences of the USSR. Among the recipients were Academician M. A. Lavrent'ev, Vice President of the Academy of Sciences of the USSR, and Academician G. K. Boreskov. For the creation of the Novosibirsk Scientific Center and successes achieved in the development of science, the Supreme Soviet awarded orders and medals of the USSR to 448 employees of the Siberian Department of the Academy of Sciences of the USSR and builders of the Novosibirsk Scientific Center (April 30, 1967, p. 1, "Pozdravlyaem geroev truda!"; see also, Izvestiya, April 30, 1967, p. 5, "Pozdravlyaem s nagradoj" and "V Prezidiume Verkhovnogo Soveta SSSR").

IZVESTIYA--ARTICLES

A119. Minister K. N. Rudnev of the Ministry of Instrument Building, Means of Automation, and Control Systems of the USSR is interviewed on the operation of his ministry, which was the first one to complete the transition to the new system of economic planning (April 1, 1967, p. 1, "Uskoritel' progressa").

A120. The procedure for planning expenditures for scientific research projects has been changed. Institutions carrying out scientific research projects planned by the State Committee on Science and Technology will have only the total sum for wages and expenditures set from above. The directors will

IZVESTIYA--ARTICLES (Cont.)

have greater leeway in determining the staff and structure of their institutions (April 4, 1967, p. 3, "Prava rasshireny").

A121. A Siberian Department of the Soviet Sociological Association has been created. The eminent sociologist and Doctor of Philosophical Sciences V. N. Shubkin has been chosen as chairman of the bureau of the Siberian Department (April 4, 1967, p. 6, "Tol'ko fakty"). [Complete text.]

A122. Construction has begun in Minsk on a large hydrometeorological center which will be equipped with modern high-speed computers, radar technology, and high-speed communication equipment (April 4, 1967, p. 6, "Tol'ko fakty"). [Complete text.]

A123. The development of modern physiology is described, including such promising fields as cybernetics and bionics (April 6, 1967, p. 5, "Fiziologiya: ee nastoyashchee i budushchee").

A124. The Presidium of the Council of Ministers of the USSR examined the plan fulfillment record of the enterprises of the Ministry of Instrument Building, Means of Automation, and Control Systems which since January 1967 have all been operating according to the new system of planning and economic incentives (April 9, 1967, p. 2, "V novykh usloviyakh--tselaya otrasl'").

A125. Academician M. D. Millionshchikov, Vice-President of the Academy of Sciences of the USSR, was unanimously elected Chairman of the Supreme Soviet of the Russian Federation (April 12, 1967, p. 1, "Na blago sovetskikh lyudej").

A126. G. I. Golyshev, Deputy Head of the Hydrometeorological Service of the USSR, discusses the value of satellites in weather forecasting, noting that the Soviet Union plans extensive international cooperation with a number of socialist countries

IZVESTIYA--ARTICLES (Cont.)

in the use of meteorological data from satellites and in the perfection and automation of methods for processing such data (April 12, 1967, p. 4, "Pogoda vsekh shirot").

A127. Academicians A. Dorodnitsyn, P. Kapitsa, M. Lavrent'ev, S. Lebedev, and N. Semenov discuss the methods of training scientific specialists employed by the Moscow Physico-Technical Institute which combine the advantages of a university and technical education. The authors believe it to be the most efficient way of training scientists and recommend it for other areas (April 13, 1967, p. 5, "Stanovlenie fizikov").

A128. A remote-control unit for controlling networks of city and industrial lighting has been installed in the Moscow Oblast' by Tomilinskie Electromechanic Works (April 13, 1967, p. 6, "Tol'ko fakty").

A129. On an exhibit of the Riga Special Planning-Design Bureau for the Mechanization of Administrative Labor under the State Committee on Material and Technical Supply (April 13, 1967, p. 6, "V pokhode za vremenem").

A130. 235 punchcard computing machines are now in operation in the kolkhozes of the Tatar Autonomous SSR (April 14, 1967, p. 4, "Tol'ko fakty").

A131. A. Amirov, Secretary of the Central Committee of the Communist Party of Azerbajdzhan, tells of plans for accelerating economic development and the growth of labor productivity, including the control of production using computers (April 15, 1967, p. 3, "Glavnyj gorizont").

A132. Cartoon illustrates the letter of L. Semenov, Doctor of Technical Sciences, who complains that the five Vil'nyus computers received by the Rostov Engineering-Construction Institute turned out to be unfit for use (April 18, 1967, p. 4, "Pis'ma kommentiruet khudozhnik"). [Translation, reproduction of cartoon, SC:RNI, this issue, p. 37.]

IZVESTIYA--ARTICLES (Cont.)

A133. An automatic continuous line for turning out showcase glass has been started up at Gomel'skij Order of Lenin Glass Factory imeni Lomonosov (April 18, 1967, p. 6, "Tol'ko fakty").

A134. In an article commemorating the 1945 Soviet-Polish pact, the Polish Minister of External Trade noted that she exports mathematical machines to the USSR (April 21, 1967, p. 2, "Ispytannyj zhizn'yu").

A135. On the problems in establishing two centralized sectorial accounting organizations in Moscow (April 21, 1967, p. 3, "Kuda ushli bukhgaltery?").

A136. An automaton-informant which performs operational accounting and transmits information on the output of parts and finished products for any industry has been produced by the Orlov branch of a special design engineering bureau (April 22, 1967, p. 6, "Tol'ko fakty"). [Complete text.

A137. The work of Lenin Prize winning mathematicians Yu. Manin and S. Novikov described (April 23, 1967, p. 3, "Zrelost' molodykh darovanij").

EKONOMICHESKAYA GAZETA--ARTICLES

A138. The main information-computing center, now being created under the Ministry of the Automobile Industry, is scheduled for completion in 1968. The center will process data from plants around the country using modern computers (No. 14, April 1967, p. 13, "Informatsionnyj tsentr avtomobilestroitelej").

A139. Brief discussion of the use of PERT planning and control system for Privolzhskaya Railroad. Data are processed in the railroad's computer center where critical paths are analyzed (No. 14, April 1967, p. 27, "Vagony i gruzy").

EKONOMICHESKAYA GAZETA--ARTICLES (Cont.)

A140. The economic and engineering goals of scientific research are defined and compared. The author believes that improvement in the system of administering science will bring these two aspects closer together and significantly raise the efficiency of scientific research (No. 15, April 1967, pp. 17-18, "Nauka v sisteme obshchestvennykh otnoshenij").

A141. V. Bogolepov, Chairman of the Section of Organization Theory of the Scientific Council on Cybernetics under the Presidium of the Academy of Sciences of the USSR, criticizes two common definitions of the scope of cybernetics and calls for viewing cybernetics as a complete science dealing with the area of control. The author lists the basic components of cybernetic science (No. 15, April 1967, p. 19, "Tochka nad 'i'").

A142. Four years ago Novosibirsk scientists developed a computer-based information system for planning and control. In the present article, a correspondent interviews Yu. Avdeev, head of the Laboratory for the Development and Application of Computer-Based Information Systems of the Siberian Department of the Academy of Sciences of the USSR, to find out what Novosibirsk scientists have done in this area recently. Avdeev explains their method of calculating PERT diagrams which they have programmed for the M-20 computer. Producers who wish to use this method but do not have access to a computer may teletype input data to the laboratory and the laboratory will return an answer the same day (No. 15, April 1967, pp. 19-20, "Laboratoriya prinimaet zakazy").

A143. The Ministry of Energetics and Electrification of the USSR has adopted a resolution on the creation of an economic evaluation center on the scientific organization of labor and management in the electrical power industry (ENERGONOT) (No. 15, April 1967, p. 27, "Reshenie prinyato").

EKONOMICHESKAYA GAZETA--ARTICLES (Cont.)

A144. A scientific and practical applications conference on ways of improving the organization of administrative work was held in Riga, together with an exhibit of furniture and hardware. Among the titles of exhibits were "Work with Documents," "Communication Hardware," "Computer Engineering," and "Overall Mechanized Systems" (No. 15, April 1967, p. 44, "Vystavka-prodazha sredstv orgtekhniki").

A145. The author explains a modification of PERT planning he helped develop which employs cyclic plan schedules (No. 16, April 1967, p. 43, "Universal'nost' plyus prostota").

A146. The Computer Center of "Rostsel'mash" Plant in Rostov-na-Donu advertises to sell its Minsk-14 computer (No. 16, April 1967, p. 47/1, "Zavod 'Rostsel'mash'"). [Translation, SC:RNI, this issue, p. 26.]

A147. The first complex plan for social development of the Leningrad party organization is being implemented at the "Svetlana" electronic instrument building association. It is noted that a building for a computer center has been built, a number of engineering, bookkeeping, and planning calculations have been mechanized, and a Minsk-22 is being debugged (No. 17, April 1967, pp. 15-16, "Kazhdomu kollektivu--chetkuyu perspektivu"). [See P48 below.]

A148. A representative of Gosplan USSR criticizes the approach to forecasting demand taken by the Ukrainian Scientific Research Institute of Trade and Public Nutrition and the Scientific Research Institute of Trade and Public Nutrition of the Ministry of Trade of the USSR. He then demonstrates the superiority of the approach taken by Gosplan USSR (Section on the Introduction of Economico-Mathematical Methods in Planning, working with people from the Section of Commodity Circulation, the Main Computer Center, and the

EKONOMICHESKAYA GAZETA--ARTICLES (Cont.)

Ukrainian and Belorussian Computer Centers). One of the main disadvantages of the first approach is that calculations must be performed manually since there is no economico-mathematical model or program for calculating by computer (No. 17, April 1967, p. 17, "EVM prognoziruet spros").

A149. The advantages of using programming to determine optimal textile assortments are discussed. It is said to be expedient to solve the problem of programming production assortment by using the so-called modified simplex method. A standard program developed in the Power Institute of the Siberian Department of the Academy of Sciences of the USSR may be used to feed calculations into the BESM-2M computer (No. 17, April 1967, p. 17, "Programmirovanie assortimenta").

A150. Measures introduced by the Laboratory for the Scientific Organization of Labor at the Novosibirsk Radio Components Plant designed to improve management and, in particular, the use of engineers' time are described. For example, data are now processed by computer rather than by calculators and slide rules (No. 17, April 1967, p. 29, "Rabochij den' inzhenera").

A151. Official methodological instructions defining the procedure for judging quality of products and awarding the state "Mark of Quality" [see A106, above] are presented (No. 17, April 1967, pp. 31-33, "Metodicheskie ukazaniya").

A152. The G. V. Plekhanov Institute of the National Economy, which is celebrating its 60th anniversary, graduates economists in various specialties including cybernetics. An electronic calculating laboratory was created to train economist-cyberneticians. It has been decided to reduce the period of study from 5 to 4 years except for those studying such complex disciplines as mathematical methods in analysis and planning, economic

EKONOMICHESKAYA GAZETA--ARTICLES (Cont.)

cybernetics, and the application of computer technology in planning and scientific research (No. 17, April 1967, p. 38, "Yubilej starejshego ekonomicheskogo vuza"). [See P50, below.]

A153. In discussing achievements and plans for construction in the country, I. Ganichev, Deputy Chairman of Gosstroj of the USSR, notes that conditions are being created for extensive introduction of mathematical methods and modern computer technology in the planning and control of the construction industry and for transition to PERT methods. More than 600 enterprises will be built this year using this method. By the end of the five-year plan, up to 30 percent of all construction projects will be completed using this method (No. 17, April 1967, p. 40, "Stroiteli--yubileyu").

MOSCOW NEWS--ARTICLES

A154. Professor Ippolit Kogan, Doctor of Engineering and Chairman of the section on bio-information of the Moscow Board of the Popov Scientific and Technical Society of Radio Engineering and Electrical Communications, discusses Soviet research in parapsychology (No. 13, April 8, 1967, p. 11, "Thought Transference or Telepathy").

A155. The Italian firm Olivetti is to supply $300,000 worth of calculating machines and typewriters to the Soviet Union in 1967 (No. 13, April 8, 1967, p. 15, "Briefs").

A156. Physician Roman Ginzburg, head of a specialized language training laboratory in Moscow, discusses the results of attempts to teach foreign languages and mathematics during sleep (No. 14, April 15, 1967, pp. 2 and 11, "Hypnopedia--Pros and Cons").

PRAVDA--PHOTOGRAPHS

P43. Electronic examiner pictured in use during geography lesson at high school No. 325 in Moscow (April 2, 1967, p. 3). [Reproduction, SC:RNI, this issue, p. 41.]

EKONOMICHESKAYA GAZETA--PHOTOGRAPHS

P44. Minsk-22 in a new shop of an electrical engineering plant in Bratislava, Czechoslovakia (No. 14, April 1967, p. 39, "Vzaimnaya pol'za sotrudnichestva").

P45. Operator at a Minsk-22 computer in the computer center of Rybinskij Motor Construction Plant (No. 15, April 1967, p. 14).

P46. In the computer center of the First State Bearing Plant in Moscow. Among those pictures is A. Ivanov, director of the center (No. 16, April 1967, p. 14, "Flagman podshipnikovoj promyshlennosti").

P47. In programmed instruction classroom at Leningrad Professional-Technical School No. 10 (No. 16, April 1967, p. 31, "Reforma i podgotovka kadrov").

P48. In the semiconductor device shop of "Svetlana" association (No. 17, April 196[illegible], p. 16, "Kazhdomu kollektivu--chetkuyu perspektivu"). [See A147 above; reproduction, SC:RNI, this issue, p. 44.]

P49. In the computer center of Kolomenskij Diesel Locomotive Construction Plant [showing a Ural-4 computer] (No. 17, April 1967, p. 29, "Rabochij den' inzhenera"). [See A150 above.]

P50. In the Laboratory of Electronic Computer Technology of the Economic Cybernetics Faculty of the G. V. Plekhanov Moscow Institute of the National Economy (No. 17, April 1967, p. 38, "Yubilej starejshego ekonomicheskogo vuza"). [See A152 above.]

BIBLIOGRAPHY OF RAND CORPORATION PUBLICATIONS IN SOVIET CYBERNETICS AND COMPUTER TECHNOLOGY

1. Ware, W. H. (ed.), Soviet Computer Technology--1959 RM-2541, March 1, 1960. Reprinted in IRE Transactions on Electronic Computers, Vol. EC-9, No. 1, March 1960.

   An account of a trip taken by two RAND computer specialists to the Soviet Union as part of an eight-man delegation representing the U.S. National Joint Computer Committee and its member societies. The genesis of the delegation and its itinerary in the Soviet Union are traced. The state of the art in Soviet computer technology as observed by the delegates is examined, showing the development, constructions, applications, routines, and components of the major Soviet computing machines. Impressions are included on Soviet education, the role of the Academy of Sciences, and Chinese developments in computer technology. Many photographs of Soviet machines, components, people, and places are included. First-hand information is also given on the BESM-I, BESM-II, Strela, Ural, and Kiev computers, plus several other machines. Machine specifications are presented in chart form, facilitating comparisons; op codes are given for the Ural-1 and Ural-2. 205 pp. Illus.

2. Feigenbaum, E. A., Soviet Cybernetics and Computer Sciences, 1960, RM-2799-PR, October 1961. Reprinted in IRE Transactions on Electronic Computers, Vol. EC-10, No. 4, December 1961.

   A description of the author's experiences as a delegate to the International Congress on Automatic Control, held in Moscow, June 27-July 7, 1960. The Memorandum discusses: (1) certain aspects of the conference; (2) some Soviet research projects in artificial intelligence and biocybernetics; and (3) general Soviet attitudes, techniques, and directions in the cybernetic and computer-related sciences. It is concluded that Soviet research in the computer sciences lags behind Western developments, but that

the gap is neither large nor based on a lack of understanding of fundamental principles. The Soviets will progress rapidly if and when priority, in terms of accessibility to computing machines, is given to their research. 77 pp. Illus.

3. Krieger, F. J., Soviet Philosophy, Science, and Cybernetics, RM-3619-PR, April 1963.

   A discussion of how all aspects of science--i.e., knowledge--are made to conform to the ideological mold of Marxism-Leninism in the Soviet Union. The larger part of the Memorandum consists of a thematic plan from the Soviet journal Questions of Philosophy [Voprosy filosofii], which lists over 300 topics suggested for discussion and study in the Soviet-planned society. 27 pp.

4. Ware, Willis H., and Wade B. Holland (eds.), Soviet Cybernetics Technology: I. Soviet Cybernetics, 1959-1962, RM-3675-PR, June 1963.

   Seven sets of translations in the area of Soviet cybernetics, together with commentary and analyses on the status of cybernetics in the Soviet Union and the direction of Soviet cybernetics research. This volume is concerned with general computer technology and cybernetics applications, rather than with specific machines. Particular emphasis was placed on selecting items for translation that survey the activities of organizations and conferences, and the current literature. 104 pp. Illus.

5. Ware, Willis H., and Wade B. Holland (eds.), Soviet Cybernetics Technology: II. General Characteristics of Several Soviet Computers, RM-3797-PR, August 1963.

   Several sets of translations detailing specifications for the Ural-2, Ural-4, BESM-II, Razdan-2, MN-10 and MN-14, Luch, and EPOS computers. The level of detail varies widely among the several articles, which were taken from such diverse sources as specification brochures, items in the popular press, technical journals, etc. Included is a set of instructions for the BESM-II which is quite dissimilar to that presented in Elements of Programming (see Vol. III in this series). 67 pp. Illus.

6. Ware, Willis H., and Wade B. Holland (eds.), Soviet Cybernetics Technology: III. Programming Elements of the BESM, Strela, Ural, M-3, and Kiev Computers, Translated by A. S. Kozak, RM-3804-PR, September 1963.

A translation from the Russian book Elements of Programming, detailing the instruction formats for five of the better known Soviet digital computers. Some notes are included to help place the machines in perspective. Specially-prepared charts give the operation codes for the five machines, along with the original Russian terminology and its English translation. 91 pp. Illus.

7. Levien, Roger, and M. E. Maron, Cybernetics and Its Development in the Soviet Union, RM-4156-PR, July 1964.

An introduction to the subject of cybernetics with special reference to its origins and ramifications in the United States and its subsequent development in the Soviet Union. Intended for non-experts in the field, it attempts to provide a sufficient non-technical background to facilitate appreciation of the potential impact of cybernetics on science and society. The survey of Soviet cybernetics reveals the intense interest and activity in the Soviet Union, pointing out how scientific research, military applications, economic planning, education, industry, etc., are affected by developments in cybernetics. 35 pp.

8. Holland, Wade B., (ed. & trans.), Soviet Cybernetics Technology: IV. Descriptions of the MN-11, MN-M and MN-7 Analog Computers and of Three Miscellaneous Electronic Devices, RM-4461-PR, February 1965

A collection of translations detailing technical specifications of the three indicated Soviet analog computers, and of the BPZ-1 fixed-delay unit, the I-5 CRT indicator, and the VPRR-2 electronic device for controlling tooling modes. The translations have been made from equipment specification brochures prepared for use by the Soviet technical and scientific community and for use at exhibits and trade fairs. 22 pp. Illus.

9. Ware, Willis H., and Wade B. Holland (eds.), Soviet Cybernetics Technology: V. Soviet Process Control Computers, RM-4810-PR, November 1965. Reprinted as "008 Russian Control Computers," in Control Engineering, Vol. 13, No. 5, May 1966, pp. 119-125.

Details of eight recently developed Soviet process control computers, based mainly on translations from Soviet source material. The translations are heavily annotated and all pictures and diagrams from the original source items, as well as several photographs from other sources, are included. The editors have appended many explanatory notes and comments, and have carefully checked each machine description from a technological standpoint. An appendix contains an alphabetical listing of all abbreviations used in the original Russian texts. 92 pp. Illus.

10. Shiller, F. F., "An Algorithmic Language for Describing Economic Mathematical Problems (ALGEM)," Digital Computer Engineering and Programming (Tsifrovaia Vychislitel'naia Tekhnika i Programmirovanie), No. 1, A. I. Kitov, Editor, Moscow, 1966; translated by Patricia L. Stephan, LT-66-44, September 1, 1966.

An unannotated translation of Shiller's description of ALGEM, a language derived from ALGOL 60 for describing economic mathematical problems. ALGOL 60 is supplemented by the introduction of string type quantities, string expressions and functions, and compound variables and functions.

11. Holland, Wade B., and Joy B. Gazley (trans.), Soviet Cybernetics Technology: VII. ALGEC--Report on an Algorithmic Language for Economics Calculations [Preliminary Version], RM-5135-PR, September 1966.

A working version of an expansion of the international high-level computer language ALGOL 60 to meet Soviet economic planning needs. A committee headed by M. A. Korolev was directed by the Soviet government to create such a language. ALGEC converts ALGOL 60 for use with the Cyrillic alphabet, provides for handling text, editing, list processing, and for access to individual items on lists and arrays. The RAND translators of the Russian draft show all changes from the original ALGOL 60. ALGOL conventions ignored by the author have been restored, and ambiguities clarified. Definitions of terms and syntactic units

have been indexed. Russian-English and English-Russian glossaries of all ALGOL and ALGEC terms are appended. (The version of ALGEC translated in this Memorandum is superseded by that contained in Part VIII, RM-5136-PR.) 158 pp.

12. Holland, Wade B. (trans), Soviet Cybernetics Technology: VIII. Report on the Algorithmic Language ALGEC [Final Version], RM-5136-PR, December 1966. To be reprinted in Cybernetics, Vol. 2, No. 2, March-April 1966 (a translation issued by The Faraday Press, Inc., of the Russian-language journal Kibernetika).

    A translation of the final version of the new Soviet Algorithmic Language for Economics Problems (ALGEC), a general-purpose computer programming language that can use both Latin and Cyrillic alphabets and either Russian or English reserved words. Based on ALGOL 60 and SUBSET ALGOL 60, ALGEC has been modified to permit the handling of tables, records, indexes, etc., and documents of complex format and variable length; it also provides a means of selecting and processing individual items from such documents and from non-numerical textual matter. Ideas and input-output procedures were taken from COBOL-61. The Memorandum includes a translation of M. Korolev's article on the development of ALGEC, a brief biographical note on the Russian authors and editor, a Russian-English glossary of ALGEC terminology, and an English-Russian glossary included in an index to definitions of terms and syntactic units. 152 pp.

13. Wirth, Niklaus, Soviet Cybernetics Technology: IX. ALGEC--Summary and Critique, RM-5157-PR, February 1967.

    A summary and evaluation of the preliminary and final versions of ALGEC, the Soviets' Algorithmic Language for Economics Problems. The ALGEC computer programming language for economics data processing is an almost pure extension of ALGOL 60. The deletions are in conformity with the IFIP-approved SUBSET ALGOL. The extensions add features obviously needed to handle non-numeric data. While not a complete list-processing language, ALGEC

appears to be adequate for business data processing, with the possible exception of decimal arithmetic. Also, input-output transfers cannot be identified by source. The retention of nested strings from ALGOL is an unnecessary complication, and the use of COBOL-style data structures (lists) precludes the handling of data with complex and dynamically varying relationships. Definitions lack precision, and the semantic and syntactic rules are unrealistic. 51 pp.

14. "Computers and Thought, Edited by E. A. Feigenbaum and J. Feldman, New York, McGraw-Hill, 1963, 535 pp., $7.95," Reviewed by A. V. Napalkov, Candidate of Technical Sciences, and Iu. V. Orfeev, Engineer, in Novye knigi za rubezhom (New Books from Abroad), Series B, Technology, No. 1, 1965, pp. 90-98; translated by Patricia L. Stephan and Wade B. Holland, LT-66-68, February 1, 1967.

    An unannotated translation of a Soviet review of the collection of articles, Computers and Thought, edited by E. A. Feigenbaum and J. Feldman. The review was published in a Soviet journal that specializes in reviewing books published in the West. The reviewers briefly cover each section of the collection, paying special attention to many of the individual articles. Some clues to Soviet attitudes can be obtained from the reviewers' comments. The treatment is quite favorable, and the review closes with a recommendation that the entire collection be translated into Russian. [It has since been learned that a Russian edition is scheduled for publication in June 1967.] 13 pp.

15. Holland, Wade B., Russian-English Dictionary of Cybernetics and Computer Technology, RM-5108-PR, August 1966.

    This dictionary contains approximately 1800 major entries, covering many aspects of the broad field of cybernetics, and a listing of Soviet computing machines. Emphasis is on the subentries which define the major terms as used in phrases, expressions, and special constructions. The dictionary was assembled in working with Russian technical literature during the course of RAND

research in computer technology and Soviet cybernetics. There has been no effort to produce a definitive glossary of the Russian terminology. The entire dictionary is stored on magnetic tape and is machine processed for output, facilitating corrections and new editions. 205 pp.