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S&T CENTER

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9 September 1986
Vol. 1, No. 8

Science and Technology Perspectives

DEVELOPMENTS

Articicial Intelligence (Czechoslovakia) The Czechoslovaks have set up an International Laboratory for Artificial Intelligence at the Institute for Technical Cybernetics of the Slovak Academy of Sciences in Bratislava. In addition to Czechoslovak scientists, researchers from the USSR, GDR, Bulgaria, Poland, and Vietnam are working at the laboratory on projects that include development of a new generation of robots with TV cameras as visual sensors. These robotic systems, which can be rapidly reprogrammed under a variety of working conditions, use a Bulgarian robot of the "Robko" type and a special computer developed by the Slovak Academy of Sciences. (East Berlin NEUES DEUTSCHLAND 12-13 Jul 86)* STAT

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FEATURE ARTICLES

REPORTS

PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the materials used in this publication will appear as abstracts or translations in the FBIS serial reports. Comments and queries regarding this publication may be directed to the Center Chief, to individuals at the numbers listed with items, or to the Science and Technology Center at

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DEVELOPMENTS:

DEVELOPMENTS highlights worldwide S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.

Advanced Materials

(EC) EURAM (European Research for Advanced Materials) and BRITE (Basic Research for Industrial Technology in Europe) will receive 40-50 billion ECU annually. EURAM focuses on basic research in areas such as metal matrix ceramics; BRITE is dedicated to applied precompetitive research which includes advanced materials, notably polymers and composites. (Paris COMPOSITES ET NOUVEAUX MATERIAUX Jun 86)* [redacted] STAT

(France) Pechiney has invested Fr 300 million to build a factory to manufacture a new aluminum-lithium alloy. Pechiney's goal is to produce 4,000 tons of aluminum/lithium annually, with operations expected to begin at the end of 1987. Although no further details on the composition of this alloy are given, its main application is said to be in the aeronautics and aerospace industries. (Paris SCIENCE & VIE July 1986) [redacted] STAT

Aerospace

(France) Because of declining sales, Airbus is "urgently" seeking an agreement with McDonnell Douglas. Details on linking the A-330, A-340, and MD-11 are expected to be worked out before the Farnborough Air Show begins in the UK at the end of August. For background on these talks, see SCIENCE AND TECHNOLOGY PERSPECTIVES 22 July 1985, Vol. 1, No. 5 pp 4-5. (Frankfurt/Main FINANCIAL TIMES 20 Aug 86) [redacted] STAT

Biotechnology

(Hungary) The "Biotechnika Corp" has begun construction of a new development laboratory at Szeged. The four-story, 2,000 square meter facility will contain a variety of laboratories that will test new products as an intermediate step toward industrial scale production. Funding for the laboratory complex amounts to 193 million forints contributed by the Szeged Biological Center of the Academy of Sciences, the State Development and Innovation Financing Bank, and the national budget. The facility will begin operations in December 1988. (Budapest NEPSZABADSAG 8 Aug 86) [redacted] STAT [redacted] STAT

Communications Equipment

(Italy/PRC) Stet, the Italian telephone consortium, is exploring the sale of sophisticated communications equipment to China, including a central telephone switchboard for Beijing. Meanwhile, China has asked Stet to jointly manufacture optical fibers and has also asked the firm for a licensing agreement to produce multiple keyboard telephones. (Turin CRONACHE DEL GRUPPO STET Jan 86)* [redacted] STAT

Computers

(Hungary) The Videoton Computer Factory expects 1986 sales in excess of 17 billion forints. Seventy percent of its products will be sold abroad. New products planned for the coming five-year plan include an upgraded SZM minicomputer system, and the development of the ES 1011Y computer system. (Budapest SZAMITASTECHNIKA in Hungarian Jul 86) STAT STAT

Factory Automation

(Italy) A bill before the Italian parliament would allocate $230 million over the next three years to provide small firms with 25 percent of the purchasing price of factory automation systems. The legislation, expected to pass in October, would benefit Italian suppliers of automated systems by requiring that key components be manufactured in Italy. (Milan MACCHINE 6 May 86)* STAT

Machinery, Electronics Center

(PRC) The Ministry of Machine Building Industry and the Ministry of Electronics Industry will manage an integrated test center in Tianjin as part of a plan to make Tianjin a base for the integration of advanced machinery and electronics. The center will develop numerically-controlled and microcomputer-controlled machine tools, telecommunications and office automation equipment. (Beijing ZHONGGUO JIXIE BAO 22 Jul 86)* STAT STAT

Microelectronics

(Brazil) Brazilian researchers have reportedly developed a new logic chip—the MC2-5000—which, makes possible a 10-percent reduction in circuit board size. The Brazilian firm Microtec will include the chip in its PCPAQ personal computer. The chips will be mass produced by the LSI Logic Corporation of California. (Sao Paulo VEJA 2 Jul 86)* STAT

(FRG) Valvo, the FRG subsidiary of Dutch Philips Elcoma and a leader in surface mounting technology, a new packaging technology to mount more circuitry in a smaller volume, envisions all its electronics components available as SMDs by 1987. It recently built a $6 million factory in the Netherlands to manufacture passive SMDs. It also estimates that, to date, it has supplied 2,000 of the 6,000 automated SMD assembly machines worldwide. (Munich ELEKTRONIK 27 Jun 86 p 26)* STAT

Mold Insulation

(PRC) China's iron and steel industry has been utilizing carbonic rice husks as a replacement for expensive graphite and aluminum in preventing molten steel from premature cooling in the ladle. The carbonized husks, much lighter than steel, form a protective cover on top of the steel and keep the steel temperature from dropping. The No. 1 Steel Factory of the Anshan Iron and Steel Complex, the pilot user, reported a 5 percent improvement in quality, which earned 4.7 million yuan ($1.27 million) in profits. Only 0.7 kilograms of rice husk costing RMB 0.84 yuan ($0.22) is required to insulate a ton of steel, compared to 2.4 kilograms of aluminum, costing 4.08 yuan ($1.10). (Beijing CHINA DAILY 20 Aug 86)* STAT

Nuclear Power

(GDR) In the wake of the Chernobyl accident, the GDR for the first time will use containment construction (enclosure of the reactors in a concrete shell) at its new Stendal nuclear power plant. The Stendal plant initially will be equipped with two Soviet VVER-1000 reactors. (West Berlin IWE TAGESDIENST 21 Jun 86) STAT

(Romania) Romania's first nuclear electric power plant will be built at Cernavoda. The plant will be of the CANDU type and will have five units. The first two units will be put into operation by the Canadian firm AECI. The plant will use natural (non-enriched) uranium. Modern high-performance computers, capable of performing all functions required in a nuclear power plant, are being designed and built by the Institute of Scientific Research for Computer Science and Data Processing in Bucharest. (Bucharest STIINTA SI TEHNICA Jan 86) STAT

Optical Fibers

(Brazil/USSR) ABC-Xtal, a Sao Paulo-based optical fiber manufacturer, is negotiating the sale of 25 thousand miles of optical fibers to the Soviet Union. The $20 million contract is expected to be signed by the end of 1986. ABC-Xtal's optical fibers recently became internationally competitive after the company achieved a 70 percent reduction in costs. (Sao Paulo GAZETA MERCANTIL 7 Jul 86) STAT

Satellites

(France/FRG) The second-generation French TDF and German TV-SAT direct broadcast satellites will use the D2-MAC-Packet broadcast standards established by France and the FRG, which provide high-quality pictures and stereophonic sound. On 29 July, the French Government announced its approval for the launch of the TDF-1 and TDF-2 satellites. The French and German PTT ministers also reconfirmed their support for the high-definition television project in the Eureka program. (Paris AGRA Data Base 1 Aug 86) Antwerp STAT

Space Research

(Italy) Italy plans to budget an annual DM 1 billion through 1992 for aerospace research. The Columbus space laboratory and the Ariane 5 launcher will receive a major portion of the funds. The Italian Government also plans to establish by year's end a national aerospace administration to be staffed by 150 to 200 employees. (Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG 13 Aug 86)* STAT

Superconductors

(Hungary) To promote development of superconductors, the National Technical Development Committee (OMFB) has given a 2.5-million-forint grant to the faculty of low temperature physics of Lorand Eotvos University (ELTE). Studies revealed that of the rare metals needed for superconductors, Hungary was relatively rich in vanadium (V) and gallium (Ga). Because of the availability of these metals, research is concentrating on fabricating and measuring the properties of V3Ga superconductors. ELTE research may serve as the basis of industrial scale production of V3Ga superconductors. (Budapest IMPULZUS No 15, 26 Jul 86) STAT

Telecommunications

(Italy) Fiat and Stet have formed Telit, a joint company that will merge the two firms' telecommunications affiliates, Italtel and Telettra. By year's end, Telit will make recommendations on joint research and development, joint management strategies, exchange of technical and marketing information, and the viability of joint ventures with other firms. (Milan TECNOLOGIE ELETTRICHE May 86)* STAT

USSR: TECHNOLOGICAL ADVANCES IN SUPERDEEP DRILLING

Key Points: The Soviets have a successful superdeep drilling program. They have reached a depth of 12,000 meters in the Kola project. Under the 12th Five-Year Plan, they expect to reach a depth of 15,000 meters. The Soviets attach a high priority to the completion of these projects: one hundred and fifty scientific research institutes and enterprises, representing 15 industries, are participating in this work.

The Soviets are making significant progress in their superdeep drilling technology program and under the 12th Five-Year Plan are continuing a series of superdeep drilling projects to be completed by the year 2000. According to TASS (29 Aug 85), Vladimir Mazur, Deputy Minister of Geology of the Russian Federation, told MOSCOW NEWS that the Soviets would drill 22 superdeep boreholes, 12 for oil prospecting and the rest for mineral exploration and tectonic research.

The importance the Soviet Government attaches to superdeep drilling is evident from the resources it has allocated to these projects. MOSCOW DOMESTIC SERVICE of 15 June 84 reports that 150 scientific research institutes and enterprises, representing 15 industries, are participating in the superdeep drilling program. According to MOSCOW NEWS (22-29 Jan 84), the drilling program, under the auspices of the USSR State Committee on Science and Technology, and is part of a large effort to study the earth's crust and upper mantle. The Joint Learned Council for Studies of Mineral Resources and Deep Drilling is coordinating the program. Headed by Professor Yevgeniy Kozlovskiy, USSR Minister of Geology, the Council includes representatives from the USSR Academy of Sciences and from over 20 ministries and numerous departments.

One of the most successful superdeep drilling projects has been the Kola borehole. In the August 1986 cover story of GOLOS RODINY, Deputy Minister Vladimir Mikhaylovich Volkov of the Ministry of Geology cites the Kola borehole as a primary example of the latest Soviet achievements in geology and applied technology. Although begun in 1970, the Kola drilling did not reach 12,000 meters until December 1984, surpassing the world record of direct penetration into the earth's interior by more than 2,200 meters. Volkov states that during this project Soviet geologists tested new technology and developed the theoretical basis which now serves as the foundation for the USSR superdeep drilling program.

PRAVDA (11 Jan 84) comments on the superdeep project in the Krivoy Rog iron ore basin. The newspaper indicates that data from this borehole should provide information on the formation and distribution of commercial-grade ores. Acoustic research methods will be tested here as well. RABOCHAYA GAZETA (3 Feb 84) predicts that drilling the Krivoy Rog borehole will take 15 years. During this time an attempt will be made to replace drilling bits without raising the drilling column, which would be a technological breakthrough. TASS (7 Sep 84) announces that only Soviet-manufactured equipment will be used in drilling the Krivoy Rog borehole.

IZVESTIYA (19 Nov 84) reports that the Sverdlovsk Scientific Research Institute of Heavy Machine Building has designed the BU-15000 rig for the Tyumen superdeep borehole. The Urals Heavy Machine Building Plant, and dozens of other plants in such places as Leningrad, Tashkent, and Kharkov, are expected to contribute to the production of the rig. EKONOMICHESKAYA GAZETA (No. 15, May 85) states that the Uralmash Association has completed the derrick and other metal structures for the rig. Drawing on the experience gained from drilling to 8,000 meters at Saatly and

12,000 meters at Kola, plans call for this rig to reach 15,000 meters. However, conditions in Tyumen, above the Arctic Circle, are considerably more difficult than those overcome in previous superdeep drilling sites.

LENINGRADSKAYA PRAVDA (17 Jul 85) announces the completion of the initial thousand meters of the Kyzyl Kum superdeep borehole, the first in Central Asia. The Muruntau Geological Surveying Party of the Uzbek Petroleum and Gas Geology Association plans to continue this drilling to 7,000 meters.

SELSKAYA ZHIZN (27 Jun 86) describes the progress on the superdeep borehole which is near Norilisk in Taymyr. According to the source, drilling has penetrated over 3,000 meters in this area of known copper and nickel deposits.

In his August 1986 GOLOS RODINY interview, Deputy Minister Volkov also spoke of the rig for the superdeep borehole which is to be drilled in the Urengoy gas field. It is a complete plant in itself, equaling a 25-story building in height and requiring special railway trains to transport it.

(Translations or abstracts of the above sources have appeared or will appear in USSR REPORT: EARTH SCIENCES.)

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JAPAN: DRAM LITHOGRAPHY MOVES TOWARD 0.1 MICRON PATTERN RULE

Key Points: The Japanese are seriously engaged in developing the next generation lithography technology after developing 4M DRAM technology. They will continue to use photolithography for 16 and 64M DRAM processing, improving this capability by using excimer lasers as a light source. For 64 and 256M DRAM processing, they may employ electron beam lithography and X-ray devices with synchrotron radiation generators as sources.

Major Japanese semiconductor manufacturers have completed 4M DRAM development and launched R&D on 16, 64, and 256M DRAM technology. According to the 19 August NIHON KEIZAI SHIMBUN, Fujitsu and Matsushita Electric recently developed 4M DRAM chips. The Tokyo press reported earlier this year that NEC, Toshiba, and Mitsubishi Electric succeeded in developing their 4M DRAM technology. In addition to these five, the Tokyo press implies that Hitachi may have developed its 4M DRAM technology.

The Japanese may continue to use conventional photolithography for processing the next-generation 16M DRAM chips. The most popularly employed lithography for 4M DRAM fabrication at present is photolithography. The press says that all the 4M DRAM chips developed by Japanese manufacturers employ a 0.8-1.0 micron design rule. Conventional photolithography is said to be limited to circuit patterns no finer than 0.5 microns. It uses as a light source visible rays at wavelengths of 380 to 780 nanometers. With shorter wavelengths, there is less diffraction and interference, and thus finer circuit patterns.

The 64 and 256M DRAM chips require finer design rules. The 64M DRAM chip requires a 0.3-0.35 micron design rule, and the 256M DRAM, a 0.2-0.25 micron rule. The heart of the 64 and 256M DRAM technology, therefore, is technology which can create circuit patterns finer than 0.5 microns. The Japanese generally assert that the next-generation lithography would include advanced photolithography, electron beam lithography, and X-ray lithography.

Advanced Photolithography

The Japanese appear to favor excimer laser technology, an advanced type photolithography, over electron beams and X-rays for 16 and 64M DRAM processing. NIHON KEIZAI SHIMBUN on 8 August indicates that photolithography using excimer lasers has been developed recently and has quickly become popular among Japanese semiconductor manufacturers. The press indicates that an excimer laser device would cost one-fourth that of an electron beam lithography device and one-eighth that of X-ray synchrotron radiation technology.

NIKKEI SANGYO SHIMBUN on 30 July reports that Toshiba has developed an excimer laser-based photolithography that can print 0.35 micron-wide circuit lines on a silicon wafer. The device uses a krypton fluoride excimer laser that beams 249 nanometer-wavelength ultraviolet rays. The surface of the silicon wafer is coated with a three-layer resist and, thus, has higher resolution. An argon excimer laser emits 193 nanometer-wavelength ultraviolet rays, enabling pattern rules as fine as 0.25 microns, which are suitable for 256M DRAM chips. The NIKKEI SANGYO SHIMBUN says that Nikon and Canon are engaged in development of excimer laser lithography technology.

Electron Beam Lithography

NIKKEI MICRODEVICES indicated in July 1985 that electron beam technology should develop rapidly in the 16, 64, and 256M DRAM era. The Tokyo press indicates, however, that for electron beam

technology to gain popularity, its throughput must be raised and the device cost must be lowered to the level of those of photolithography. The newest electron beam devices reported in the press are as follows:

- NIKKAN KOGYO SHIMBUN and NIKKEI SANGYO SHIMBUN on 19 June report that NTT developed the EB60, an electron beam lithography device capable of etching 0.5 micron circuit patterns directly onto a wafer at high speed. The device can process 20 4-inch wafers per hour for a 16M DRAM chip, compared with only one 4-inch wafer with the conventional electron beam exposure system.
- Toshiba, according to the August issue of NIKKEI MICRODEVICES, developed the EX-7, an electron beam lithography device capable of etching 0.25 micron circuit lines on 16, 64, and 256M DRAM chips. The device can process six 4-inch wafers per hour for 16, 64, and 256M DRAMs.
- Hitachi and NTT, according to NIKKAN KOGYO SHIMBUN on 3 July, jointly developed a EB-F electron beam lithography device capable of drawing 0.1 micron circuit patterns with 0.04 micron precision. The device can print the circuit patterns for 256M DRAM chips. The device uses a 0.03 micron beam spot running 3 nanoamperes of beam current, which translates to a processing speed more than 10 times faster than conventional devices. The device uses a field electron emission gun as an electron source. The NTT Atsugi Electric Communications Laboratory purchased the first model.
- NIHON KEIZAI SHIMBUN on 5 June reports that Hitachi and Toyohashi University of Technology jointly developed an electron-ion hybrid beam source consisting of a tungsten emitter chip surrounded by liquid gallium, which gradually moves down the emitter's tip to produce an ultrafine point with a radius of less than 10 angstroms, compared with 1,000-2,000 angstroms for conventional emitter chips. The beam source will produce ion and electron beams alternatively by switching the extraction voltage from plus to minus. Ion beams will reportedly etch circuit patterns suited for 64M DRAMs, and electron beams will be used for three-dimensional viewing of the circuit pattern being etched.
- Toshiba Machinery, the 26 May NIKKEI SANGYO SHIMBUN reports, has developed the world's fastest electron beam, lithography device the EBM-1600/80, which can print circuit patterns as fine as 0.1 micron on photomasks twice as fast as conventional devices.

X-ray Lithography

The Japanese believe that X-ray lithography technology may take some time to develop fully. NIKKEI SANGYO SHIMBUN on 8 August says that current X-ray lithography suffers from weak X-ray sources that prolong the time to print circuit patterns on a silicon wafer. The article points out that X-ray lithography devices will not be commercially available until more powerful X-ray sources such as synchrotron radiation (SOR) generators are developed. The article indicates that photomasks and resists for X-ray processing must be properly developed as well.

The Japanese appear to be serious about development of X-ray lithography, especially SOR technology. They recently launched a large-scale R&D effort to develop SOR generators, according to the June issue of NIKKEI MICRODEVICES. In June, 13 Japanese semiconductor manufacturers established a joint company to develop the technology under the sponsorship of the Key Technology Center, a government R&D promotional institute. The participants are Oki, Canon, Toshiba, Sanyo, Sharp, Sumitomo Electric, Sony NEC, Mitsubishi Electric, Hitachi, Fujitsu, Nikon, and Matushita Electric. The new company, Sortec, will spend 15 billion yen over the next 10 years to develop small SOR generators for next-generation integrated circuits.

The following are some of the recently developed X-ray related lithography technologies mentioned in the press:

- According to NIKKAN KOGYO SHIMBUN on 27 May, Mitsubishi Electric developed a negative-type X-ray resist and a new process to prevent resolution from deteriorating. The resist is made of chlorinated polymethylstyrene and achieves an 8 millijoules per square centimeter resolution. Resolution deterioration is prevented through a computerized process. Mitsubishi has already succeeded in developing a prototype chip with 0.3 micron patterns.
- NIHON KEIZAI SHIMBUN on 15 July reports that NTT developed a plasma X-ray radiation source of 0.9-1.4 nanometer wavelength capable of drawing 0.3 micron patterns. Reportedly, the new X-ray source is more than 10 times more powerful than a conventional X-ray source.
- The Electrotechnical Laboratory of MITI's Agency of Industrial Sciences and Technology developed an X-ray exposure system effective in printing circuit patterns for the next-generation integrated circuits, although the scale of integration was not mentioned. NIKKEI SANGYO SHIMBUN on 2 July reports that the system uses an excimer laser which emits ultraviolet rays. The 300 watt excimer laser reportedly processes one hundred 4-inch wafers per hour.

(Translations of the above sources will appear in JAPAN REPORT: SCIENCE AND TECHNOLOGY.)

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JAPAN: NUCLEAR POWER TO SUPPLY 58 PERCENT OF ENERGY NEEDS BY 2030

Key Points: A recent report by MITI estimates that 58 percent of Japan's energy needs in the year 2030 will be met by nuclear power, according to Tokyo press accounts. Despite the recent stagnant condition of the nuclear industry, this report takes the rather optimistic view that the nuclear power related market will total 6.7 trillion yen in 2030, four times the 1985 level.

MITI's Advisory Committee for Energy submitted its "Nuclear Energy Outlook" report on 18 July to Michio Watanabe, who was MITI Minister at that time. The report assesses domestic energy demands for the next 45 years and proposes energy-related policies, according to NIHON KEIZAI SHIMBUN on 5 and 19 July and DENKI SHIMBUN on 21 July. Nuclear power is expected to generate 58 percent of Japan's energy by 2030, and will require doubling the present capability. The number of reactors will increase from 32 to 112. Specifically, the next 25 years are described as the "fuel cycle establishment period." The 20 years from 2010 to 2030 are called the "fast breeder reactor (FBR) utilization period." Japan's nuclear power industry as a whole by 2030 will probably grow to be a 6.7 trillion yen business, four times higher than its 1985 level. A summary of the report from TSUSANSHO KOHO on 22 July and GENSHIRYOKU SANGYO SHIMBUN on 24 July follows in tabular form:

		Estimate A		Estimate B	
	1985	2010	2030	2010	2030
Total Power Demand (billion kWh)	5,928	11,300	15,900	10,100	12,400
Nuclear power generating facilities (10,000 kW)	2,452	8,700	13,700	7,700	10,700
N.P.G ratio (%)	16	32	40	32	40
No. of reactors	32	86	112		
Nuclear power generation ratio (%)	26	49	58	49	58
Nuclear power generation (billion kWh)	1,590	5,500	9,000	4,800	7,000
N.P.G. ratio (%)	26	40	58		
N.P.industry personnel (10,000)	5	13	17		

(Note: Estimate A is based on a 2.5 percent GNP annual growth. Estimate B is based on a population and energy demand projection. N.P.G: nuclear power generation.)

Light water reactors (LWR) will be used for some time to come because FBR development will be rather slow. Present reactor technology developed for reactors should be applied over the next five to

10 years. The actual operation of "new type" LWRs is projected for the mid 1990s, and the next generation LWR is expected in 2005. Plans for advanced-type reactor introduction are as follows:

	power (10,000 kW)	In operation since
Fugen	16.5	1979
Prototype reactor at Ohma plant	60.6	1995
Jyoyo FBR	10	Critical level since 1977
Monju FBR	28	Under construction 1992 critical level.
Prototype FBR		R&D aiming at post-2000 operational status.

Presently, the US and France enrich uranium for Japan under contact. Japan Nuclear Fuel Industry is expected to operate its own enrichment facility in 1991 with a 1,500 ton SWU (Separative Work Unit) per year capability. Japan Nuclear Fuel Service is preparing to operate a commercial reprocessing factory in 1995 with a capability of 800 tons of uranium per year.

The report recommends development of a "new type" nuclear reactor and stresses increased private sector participation in research and development. The FY 84 development fund was 370 billion yen, of which 110 billion yen was funded by the private sector. The report's "Safety 21" program advising "the principle of safety first" comes in the wake of the Chernobyl accident and stresses preventing human error.

Japan achieved a 76 percent facility operating rate last year, the highest in the world. The report proposes that the nuclear power industry be moved from the status of a "special industry" to an "ordinary industry" because it is now a "mature" industry.

(A translation of the above source will appear in JAPAN REPORT: SCIENCE AND TECHNOLOGY.)

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REPORTS

REPORTS surveys research trends in articles and books involving a particular field of science and technology. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will also be occasionally presented in this section.

HUNGARY: INADEQUATE COMPUTER CAPABILITY IN SCIENTIFIC RESEARCH

A report in the Hungarian monthly INFORMACIO ELEKTRONIKA details inadequacies in computers used at the Hungarian Academy of Sciences, outlines the Academy's policy for developing its computer network, and lists the computers already installed at the academy's various research institutes.

Zsuzsa Szentgyorgyi, a high official at the Hungarian Ministry of Industry, writes in the No. 3 1986 issue of INFORMACIO ELEKTRONICA that computer power available to the Hungarian Academy of Sciences and its research institutes lags seven to 10 years behind that of the rest of the world and is especially inadequate where mainframes and network systems are concerned. The academy's largest computer, the IBM 3031, came online five years ago. COCOM embargoes have prevented acquisition of any more IBMs. The newest computer currently being installed, the ES-1045, is "well below the state of the art" according to Szentgyorgyi.

In an effort to overcome these inadequacies and maximize use of already-installed computers, the Academy is establishing a large regional computer network to serve its local research sites. The local sites, however, have requested special service features such as graphics, real-time use, and analog/digital conversion capability. At present, users at these sites can access 50 percent of the Academy's central computer park and 70 to 80 percent of the IBM 3031 through the network. To meet growing needs for network services, the Academy has outlined the following goals:

- Improve central service from the large computers
- Continue development and modernization of the large regional network
- Establish local networks based on superminis which can handle special requirements
- Allocate professional personal computers to less-frequent users with the understanding that they will ultimately become part of the network.

Szentgyorgyi adds that ES(IBM) large mainframes and TPA(DEC) mini and supermini computers should be installed and that joint data bases with equal access should be set up.

The author also details current computer capabilities at Hungary's two major research institutes.

Computers at Major Academy Research Institutes

Computer Location	Machine Make	Storage	Backup Memory*	Installation Date
SZTAKI**	IBM 3031	2M bytes	600M bytes	1980
SZTAKI**	CDC 3300	256K bytes	168M bytes	1971
SZTAKI**	ES-1035	1M bytes	270+1600M bytes	1980
KEKI***	ES-1035	1M byte	638M bytes	1977
KEKI***	ES-1045	being put on line		

*disc
**Computer Technology and Automation Research Institute
***Central Research Institute for Physics

(A translation of the above source will appear in EUROPE REPORT: SCIENCE AND TECHNOLOGY.)

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USSR: FEMOTOSECOND PULSED LASER

Soviet physicists at Moscow State University are acclaiming their recent development of a femtosecond pulsed laser as a major breakthrough in Soviet optoelectronic physics, according to USPEKHI FIZICHESKIKH NAUK. The laser, which generates a pulse with a duration of ten femtoseconds and an intensity reaching 100 trillion watts per square centimeter, was constructed after 15 years of research.

The transition to the femtosecond scale in Soviet laser physics was made possible only with the advent of monomode fiber light guides, according to the Soviet physicists. Fiber optics technology enabled researchers to compress light into high power pulses with durations of only 10 quadrillionths (10-14) of a second, or less.

The lasers provide the Soviet scientists with unprecedented accuracy in the study of nonequilibrium states in atoms and molecules. They are particularly applicable for high-resolution spectroscopy and photochemistry. The ultrashort pulse functions as an efficient probe for the investigation of processes in the microworld that occur in a trillionth or a fraction of a trillionth of a second, such as the periods of the rotations of molecules. Devices using the femtosecond pulses to study molecular processes are like cameras with shutter speeds of only a few quadrillionths of a second that can record unimaginably rapid motion without blurring it. The analysis of such motion gives the Soviet scientists information about such subpicosecond phenomena as the chain of events that leads to vision in animals and humans when light is absorbed by the retina. Other applications of the femtosecond pulses projected by the Soviet physicists include the use of the pulses as means for the rapid transmission and processing of information in fiber optics communications systems.

(A translation of the above article will appear in USSR REPORT: PHYSICS AND MATHEMATICS).

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USSR: SCIENTIFIC-TECHNICAL COMPLEXES

Late in 1985, a joint decree issued by the CPSU Central Committee and the USSR Council of Ministers created Interbranch Scientific-Technical Complexes (Mezhotraslevyye nauchno-tekhnicheskiye kompleksy) or MNTKs. To date 21 of these MNTKs have been formed: 1) Electric welding; 2) Svetovod (fiber optics); 3) Biogen (biological engineering); 4) Nadezhnost (machine reliability); 5) Tekhnologicheskiye lazery (industrial lasers); 6) Personalnyye EVM (personal computers); 7) Robot (automated control systems); 8) Membrany (membrane technology); 9) Nefteotdacha (oil extraction); 10) Rotor (rotor conveyor lines); 11) Metallurgmash (machinery for metallurgy); 12) Katalizator (catalyst); 13) Poroshkovaya Metallurgiya (powder metallurgy); 14) Antikor (anticorrosion); 15) Mekhanbor (advanced crushing and pulverizing equipment); 16) Termosintez (synthesis of inorganic compounds); 17) Radiatsiya (radiation); 18) Mikrofotoelektronika (miniaturized opto-electronic detectors); 19) Impulsnyye Mashiny (pulsed-power machines); 20) Avtomatika (computer-aided automation); 21) Mikrokhirurgiya Glaza (eye microsurgery).

Five MNTKs will be discussed below in terms of the organizational setups, assigned tasks, and basic problems involved with them.

MEMBRANY (MEMBRANE TECHNOLOGY)

The USSR seriously lags behind other countries in membrane technology. In IZVESTIYA on 17 July V. Dubyaga, head of the "Polimersintez" NPO and the new "Membrany" MNTK, describes problems facing the formation of this MNTK. The "Membrany" MNTK will have as its head institute the "Polimersintez" NPO. It will include scientific institutes, a design bureau, experimental bases and problem-solving laboratories of Minkhimmash (ministry of Chemical Machine Building), Minlegprom (ministry of Light Industry), and Minvuz (ministry of Higher and Secondary Specialized Education), and other institutes. According to Dubyaga, this MNTK wants to apply the existing technology for production on a wide scale. The organization, however, suffers serious problems. A unified plan for research work was not established until very recently. No production facilities have yet been built, although plans for them have finally been proposed. A scientific center for training personnel is also lacking.

PERSONALNYYE EVM (PERSONAL COMPUTERS)

This MNTK aims at developing highly reliable personal computers, with a goal of 1.1 million such units set for the next five-year plan, and with an eventual target of millions. Academician Boris Naumov, director of the Informatics Problems Institute, describes problems faced by his MNTK in IZVESTIYA on 11 July. He finds "departmentalism" the biggest problem. The MNTK must deal with a total of 34 ministries in pursuit of its mission, four ministries in developing computers and 30 ministries in manufacturing parts and materials. The MNTK is also involved in two international programs for personal computer development. The MNTK, therefore, suffers from a confusion of brands and software. The MNTK has no facilities for R&D and experimental production, and its chief institute is scattered in various parts of 17 different buildings around Moscow. In addition, critical project designs of a national level have been tied up for months seeking coordination. Resources for the successful functioning of the MNTK have been so far provided only by the Academy of Sciences, with the ministries standing aside.

MEKHANBOR (ADVANCED CRUSHING AND PULVERIZING EQUIPMENT)

In LENINGRADSKAYA PRAVDA on 14 February Vladimir Ivanovich Revnivtsev, director of the All-Union Scientific Research and Design Institute of the Mechanical Processing of Minerals and head of the MNTK "Mekhanbor," states that the task assigned to the MNTK "Mekhanbor" is to coordinate efforts of parallel operations throughout Soviet industry for processing raw materials, and to establish engineering and regional scientific and technical centers for new equipment and the training of specialists in this area. "Mekhanbor" will be composed of 10 sectorial scientific research institutes, the same number of academic and higher learning institutes, departmental organizations and industrial giants such as Uralmash, Novokramatorskiy Mashinostroitelnyy Zavod, and other production associations. Revnivtsev claims that models of machines of a higher technical level than world counterparts are ready to be built in the next five-year plan. The five-year plan also calls for a savings of 100 million rubles, with a projected savings of 2 billion rubles by the year 2000.

MIKROKHIRURGIYA GLAZA (EYE MICROSURGERY)

According to Pravda on 13 July the "Mikrokhirurgiya Glaza" MNTK will be made up of the Moscow Scientific-Research Institute of Eye Microsurgery of the RSFSR Ministry of Health, and experimental plants and affiliates of the institute in Volgograd, Kaluga, Krasnodar, Leningrad, Novosibirsk, Orenburg, Sverdlovsk, Tambov, Khabarovsk, Irkutsk, and Cheboksary.

The surgery is an assembly-line operation in which all procedures are controlled by computer. The patients are lined up as if on a conveyer belt. When the computer shows that each step of a surgical procedure has been completed, the patient will then move to the next procedure. The surgeons are specialists working as a team, with each phase of the operation monitored by a color videocamera attached to a microscope. At present the assembly line handles cataracts, myopia, and glaucoma. According to Svyatoslav Nikolayevich Fedorov, head of the new Eye Microsurgery MNTK and head of the collective which pioneered the surgery, with this method of surgery average cost per patient has dropped from 157 rubles to 40 rubles.

The Eye Microsurgery MNTK has been given the authority to solve any problem in any ministry or institution under its supervision, and can place orders for instruments, lenses, and needed equipment from abroad without a middleman. A new system of financing permits it to cover expenses in research and medical treatment as it sees fit.

The complex, due to be fully operational in the next three years, will deal with cataracts, glaucoma, myopia, astigmatism, far-sightedness, and progressive juvenile myopia. The complex will perform 1,000 operations per day, and up to 200,000 per year. This will be done at the 12 branches of the MNTK (including Moscow). Success, however, depends on how quickly these institutions become available throughout the country, and on continuing developments in modern medicine.

NADEZHNOST (MACHINE RELIABILITY)

The Machine Reliability MNTK was created to meet the needs of the Soviet economy for advanced automation of equipment and to make unique and complex equipment more reliable and durable. Twelve billion rubles a year are spent in the USSR on the replacement of worn-out parts. Expenditures on repair and maintenance are several times greater than those involved in making new equipment. According to PRAVDA on 23 June the principal organization of the "Machine Reliability" MNTK will be the Institute of Machine Studies of the USSR Academy of Sciences. Through the MNTK the Academy will seek to integrate the work of its institutions with industry, research institutes, and design bureaus and with research and production associations. The MNTK will be made up of the following: the Institute of Machine Studies and its affiliates, the Institute of Superplasticity of Metals, and the Control Design Bureau of Unique Instrument Building. Branch organizations and enterprises will also participate, among them the "Spektr" and "Burevestnik" NPOs, the Central Steam Boiler and Turbine

Institute, the "Vibropribor" and "Tenzopribor" plants, and the "Tochmashpribor" NPO. Plans have already been worked out for this MNTK. Factories, however, are unable to implement the plans until Gosplan frees them from previous tasks and provides them with production facilities.

For problems associated with the Electric Welding MNTK headed by Boris Paton, the Industrial Lasers MNTK headed by G. A. Abilsiitov, and the Catalyst MNTK headed by K. I. Khamareyev, see SCIENCE AND TECHNOLOGY PERSPECTIVES, 26 August 1986, Vol 1, No. 7.

(Translations or summaries of the above sources have appeared or will appear in USSR REPORT: SCIENCE AND TECHNOLOGY POLICY.)

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PREVIEWS

PREVIEWS is an annotated list of selected science and technology items being translated by FBIS. The list may also contain previously published items of wide consumer interest.

EUROPE REPORT: SCIENCE AND TECHNOLOGY

AEROSPACE

ESA REVIEWS PLANS FOR HOTOL, SANGER, HERMES, COLUMBUS

The article explains how technology, national interests and money are beginning to converge into an overall European aerospace policy. (Duesseldorf HANDELSBLATT 15/16 Aug 86 p 2)

FRG AEROSPACE RESEARCH STATUS, OBJECTIVES OUTLINED

This report by the Embassy of France in Bonn outlines the activities of the BMFT and DFVLR, including the European Transonic Windtunnel, the FRG space program in general and specifically such areas as communications satellites, remote sensing, 1985 policy decisions and financial allocations, Ariane 5, Columbus, microgravity experiments and industrial use of space. (Bonn SERVICE SCIENTIFIQUE, AMBASSADE DE FRANCE 7 Oct 85 pp 1-18)

BIOTECHNOLOGY

REPORT ON FRG APPLIED BIOLOGY, BIOTECHNOLOGY PROGRAM

This report by the Embassy of France in Bonn gives the main features of the program begun in July 1985. A table showing BMFT funding figures and principal research themes is included. (Bonn SERVICE SCIENTIFIQUE, ABASSADE DE FRANCE 28 Aug 85 pp 1-4)