Scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics of the USSR Academy of Sciences (28–29 September 1983)

Usp. Fiz. Nauk **143**, 319–325 (June 1984)

A joint scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics of the USSR Academy of Sciences was held on 28 and 29 September 1983 at the P. N. Lebedev Physics Institute of the Academy of Sciences of the USSR. The following papers were read:

28 September

1. *V. A. Mel'nikov, I. L. Talov, and Yu. N. D'yakov.* Micro- and minicomputers; personal computers.
2. *B. N. Naumov and I. Ya. Landau.* Small computer systems.
3. *B. I. Ermolaev.* The "Ryad" unified computer systems.
4. *A. A. Novikov.* The "El'brus" computer system.

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5. *A. A. Migdal.* Lattice models in quantum chromodynamics and results of computer calculations.
6. *E. G. Maksimov.* Use of computers in the physics of the condensed state.
7. *R. Z. Sagdeev.* Numerical simulation of plasma situaitons. A brief summary of three of these papers is published below.

B. N. Naumov and I. Ya. Landau. *Small computer systems.* The development of the small computer system (SCS) began in 1974 as a collaboration between Bulgaria, Hungary, East Germany, Cuba, Poland, Rumania, USSR, and Czechoslovakia. The principal areas of application of the SCS were decided to be automation of technological processes, automation of scientific research and testing equipment, and computer-aided design.

The first essential step in the coordination of development of SMS facilities and the setting-up of a manufacturing base was to define the general priciples on which these systems should be built and the architecture of the system. The first stage was therefore to develop a system of SMS standards defining the architecture, interfacing, and physical structure.

The first generation SCS (1974–1979) involved the development and production of four processor models, ferrite and semiconductor memories, peripheral storage devices based on magnetic tapes and disks, and a number of interfaces. The SCS design provides for individual devices in the form of self-contained units of standard dimensions, containing their own supplies and ventilators. Together with standardized interfaces, this ensured that different combinations of such units could be put together without special adjustments.

The SM-4 is now the most widely used SCS processor. It is capable of performing about 900 000 operations per second (of the register-to-register type) and has a main memory of up to 256 kb. Assemblies based on the SM-4 incorporate disk (5 and 29 Mb) and tape (10 Mb) storage devices, printout units, alpha-numeric and graphic displays, teleprocessing devices, and a number of other facilities.

In addition to standard SCS assemblies (14 versions are now in production) for the most common application, problem-oriented assemblies (POA) are also being produced. POA releases include systems for the control of scientific experiments (measuring and computing assemblies, MCA, of which there are six versions) and computer-aided design (automated work stations, AWS, of which there are three types). In addition to standard SCS units, the MCA incorporate CAMAC equipment (the MCA modifications differ by the number of input-output channels for analog and digital signals and the precision and speed of analog-to-digital converters). AWS incorporate facilities for the processing of graphical data (graphic displays, graph plotters, and digitizing devices).

Users requiring configurations other than standard assemblies and POA's can order different combinations of the basic units. Such customized releases account for about 60% of the SCS machines.

The second generation of SCS was developed in 1979 and was designed for the 1980-1984 period. In addition to the SM-4 line, the second-generation machines incorporate the SM-1800 8-bit microcomputer. The latter is designed for data-acquisition and primary data-processing, the automation of accountancy in small enterprises, word-processing, and so on. The SM-1800 requires no special servicing and is very simple to use.

The second-generation machines that are language-compatible with the SM-4 are the SM-1800 micro and the SM-1420 mini. They constitute a downgrading of the SM-4 (the SM-1800 performs about 500 000 operations per second and has a 56-kb memory) as well as an upgrading (the SM-1420 performs 1 million operations per second and has a

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memory of up to 2 Mb). Extensive utilization of modern microprocessor technology has ensured that the central portion of the SM-1420 assemblies is smaller by a factor of three as compared with the SM-4.

The SCS machines are now being used in economics, education, commerce, medicine, transport, and communication systems, i.e., in practically all branches of the national economy. It has therefore become necessary to increase sharply the rate of production of the SCS machines. This has necessitated a substantial increase in the reliability of the SCS assemblies, a simplification of servicing procedures, and the development of new turnkey systems with all the necessary software. This program is to be implemented by the third-generation SCS (1984–1987). One of the basic requirements that the third-generation machines will have to satisfy is compatibility with the second-generation machines insofar as software and interfaces are concerned. In addition to the further development of the existing SM-4 and SM-1800 machines, the third-generation SCS will include 32-bit mega- and minicomputers, further integration of the SCS and the ES computers, and the development of a new class of micros, namely, the personal computer (PC). The PC is a machine designed for individual use and, despite its low cost and tabletop location, it will compete with the current SM-4 system.

The modern user of computers relies on the operating system, (OS), and the properties of this system may well be more important for him than particular equipment characteristics. In view of the wide range of applications of the SCS, several operating systems have been developed for each architectural line (OS RV, RAFOS, DOS KP, and DIAMS for the SM-4, and OS 1800 and MOS RV for the SM 1800).

The SCS operating systems provide for a wide range of programming languages (FORTRAN, BASIC, COBOL, and PASCAL), as well as facilities for the preparation and editing of string data, graphics programming, and networking.

In addition to the operating systems, the SCS software that is now available includes software packages such as database management, numerical analysis, analysis of experimental data, and so on.

In addition to functional possibilities of existing software, it is planned that the third-generation SCS will have mobile (suitable for machines of different kinds) software. In particular, the INMOS operating system, suitable for all types of SCS machine, will be developed.