synthetic fibers are carried out annually. The extension of the use of polymeric materials in many areas of medicine requires further improvement of their manufacture and correct utilization. The following are among the most important scientific technologic problems which await a solution in the near future.

1. The evolving of polymeric materials possessing high-grade hygienic properties and stable indices, and also a number of specific properties. These materials are needed for the creation of artificial organs, viz., heart, kidneys, liver and lungs. For example, for blood oxygenators one requires membrane materials having high selective permeability for oxygen and carbon dioxide, and for hemodialyzers one requires materials having high permeability for metabolites which need to be excreted from the body.

2. The evolving of polymeric materials having high physicomechanical indices (typically with a low friction coefficient, and with thrombosis resistance, biological inertness or biocompatibility). These materials are needed for ensuring high reliability of internally implanted prostheses, viz., the most advanced prostheses of blood vessels, heart valves, foam compositions for filling of postoperative cavaties, materials for replacing destroyed areas of bones, the production of artificial joints, etc.

3. The creation of basic materials and technologic equipping for the manufacture of articles with high optical characteristics for artificial crystalline lenses, corneal prostheses, and modern therapeutic and prophylactic agents such as ophthalmic therapeutic films. This is required by the new methods of surgical and conservative therapy evolved by ophthalmologists.

4. The creation from polymers of diverse types of articles and apparatuses for transfusion technique (containers for preparation, storage and transporting of biologic products, transfusion systems, apparatuses for sublimational drying of blood preparations, etc.). They are necessary for the new methods of preparation and processing of blood, bone marrow, and other biologic products.

A solution of the foregoing problems, requiring effective coordination of the studies of teams of different institutes and factories and the close creative contact of chemists, engineers, and physicians, will facilitate the accomplishment of the tasks promulgated by the 25th Congress of the Communist Party of the Soviet Union for the uttermost improvement of the standard of the medical services to the population of our country.

M E D I C A L  I N S T R U M E N T S  A N D  T H E I R  R O L E  I N
T H E  D E V E L O P M E N T  O F  M E D I C A L  T E C H N I Q U E S

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The efforts of scientists and production workers of the medical instrumentation industry are being directed to creating high-efficiency instruments and sets of them for equipping all medical sectors.

Today the National Research Institute of Medical Instruments (NRIMI), a special engineering design office called "Medinstruments" and 8 factories which issue more than 2500 different instruments are working to provide the health service with new instruments. In the tenth five-year period alone 518 sets and instruments, 72 units of special engineering equipment, and 223 furnishing units have been devised and improved.

A program of studies on the equipping of the health service with new instruments is proceeding along three lines: 1) the creation of sets and instruments for the latest medical techniques, 2) the elaboration and introduction of new instruments for carrying out the established (traditional) techniques, and 3) modernization and increase of the quality of serially issued instruments.

The major part of the new creations consists of mass-produced instruments. For instance, for surgery in the tenth five-year period there have been evolved 210 new instruments, and for dentistry large sets and
instruments of 46 designs. The introduction of new medical techniques in ophthalmology and the development of microsurgery are closely bound up with the elaboration of delicate microinstruments. To provide for methods of surgical treatment of glaucoma the NRIMI has evolved and put into production kits and instruments, one of which, namely a set of instruments for emergency ophthalmologic surgery, was awarded a Diploma and Gold Medal at the Leipzig International Exhibition in 1976. The creation of instruments for operations under the microscope demanded from industry a reorganization of production. Miniaturization of designs and the use of new materials and alloys have occasioned a need to organize specialized production at the P. V. Gusenkov Medical Instruments Factory in Mozhaisk. A solution was found for problems of manufacture of conical pivotal instruments, enabling the provision of dentists with drills, root perforators, canal fillers, and other instruments for treating the dental canal. Kits for child dentistry were perfected for the first time. For the diagnosis, prophylaxis, and treatment of maxillo-dental deformities 15 instrument types were introduced. Joint work with leading institutions of the Ministry of Health of the USSR has made it possible to rapidly revise the nomenclature of dental instruments. This has resulted in the elaboration and perfecting by industry of a whole range of instruments for dental therapy and surgery. The introduction of high speed drills has enabled a considerable increase in the work productivity of dentists and in the quality of their work. The increase in quality of instruments was made possible not only by the use of the latest steels and engineering processes but also by the great help given by leading scientists, including Prof. A. I. Rybakov, A. I. Doinikov and I. I. Ermolaev.

In accident surgery and orthopedics use is being made of new sets and instruments made of titanium for conservative methods of correcting deformities of bones and joints and lengthening of limbs. Kits have been created for atraumatic removal of the meniscus, devices for painless removal of skeletal traction clamps and other items.

The outcome of operations, the time of recovery and the postoperative period are determined by the quality of medical engineering. For instance the introduction of instruments made of the new polymeric materials for anesthesiology, urology, and surgery has made available to the medical armamentarium items for single-time use in sterile form, especially for pediatric departments. In total, 64 kits and sets of instruments made of polymers (190 type sizes) have been introduced. For tracheal intubations, intubation tubes with an inflatable cuff made of plastisol have been developed and perfected for the first time in general practice. Items made of polymers withstand repeated sterilization, including gas and radiation sterilization, and are nontoxic. Transparent tubes made of polymers allow observation of processes of drainage and return flow of fluids.

In ophthalmology some new techniques have been introduced solely as a result of new instrument kits. In gynecology a new set of instruments is in use for Wertheim’s operation, enabling an increase of effectiveness and shortening of the duration of the operative interventions.

A broad avenue for new medical techniques is opened up by the use of low-frequency ultrasound in surgery. Soviet scientists have been designated laureates of the State Prize for the elaboration and introduction of methods of ultrasound welding and cutting of bones. At the present time hundreds of operations are being carried out with use of ultrasound in ophthalmology, orthorhinalar.Argology, and surgery.

The introduction of the new medical techniques requires the corresponding development of medical engineering. New instruments, especially for microsurgery, are being manufactured currently from titanium and from dispersion-hardening alloys. Working parts of surgical instruments are plated with hard alloys. To ensure uniformity of engineering processes 72 units of special engineering equipment and 29 new engineering processes have been evolved and introduced. Diamonds are extensively used for mechanical processing in the medical instruments industry.

Prognosis of the development of sectors of medical engineering have been worked out in the medical industry. For the new medical techniques it is anticipated that 1430 sets and instruments will be evolved in the next few years. The introduction of microsurgery in the different sectors of medicine has enabled the creation of specialized services, viz. from designers to production, due to which the requirements of high accuracy of the instrument are combined with mass production. In addition to the already evolved microinstruments for treatment of ocular injuries, NRIMI is evolving a set of instruments for removing foreign bodies. It is anticipated that new sets of ophthalmologic instruments will become available for corneal grafting, restorative surgery on the iris, operations on the vitreous, and surgical treatment of cataract by the extracapsular method. It is expected that instruments will also be provided for reconstructive microsurgery of vessels by the techniques of Acad. B. V. Petrovskii and Prof. V. S. Krylova, particularly with atraumatic microneedles.