



Annual Report 1980-'81

Sree Chitra Tirunal
Institute for Medical Sciences and Technology
Trivandrum, Kerala



STATE CAPITAL BUILDING, MEDICAL CENTER

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ADMINISTRATIVE BODIES

Governing Body

Minister for Health, Government of Kerala
(Chairman)

Secretary to Government, Planning &
Economic Affairs, Government of Kerala

Secretary to Government, Department of
Science and Technology, Government of India

Director General of Health Services,
Government of India

Principal, Medical College, Trivandrum

Dr. K. V. Krishnadas, Prof. of Medicine,
Medical College, Trivandrum.

Chairman, Postgraduate Board of Medicine,
University of Kerala

Dr. R. M. Varma, Professor Emeritus,
NIMHANS, Bangalore

Prof. V. Ramalingaswami,
Director General, ICMR

Prof. S. Ramaseshan, Director, Indian
Institute of Science, Bangalore

Sri. K. P. P. Nambiar, Chairman and
Managing Director, KELTRON

Prof. K. N. Raj, Centre for Development Studies

Dr. G. Mathews,
Professor of Neurosurgery,

Head, Biomedical Technology Wing

Director

Executive Committee

Prof. K. N. Raj (Chairman)

Secretary, Department of Planning &
Economic Affairs, Government of Kerala

Secretary, Department of Science &
Technology, Government of India, New Delhi

Chairman, Postgraduate Board of Medicine,
University of Kerala, Trivandrum

Dr. R. M. Varma, Professor Emeritus,
NIMHANS, Bangalore

Head Biomedical Technology Wing

Director

Administrative Staff

Director

Dr. M. S. Valiathan

Medical Superintendent
Brig. S. Gopalakrishnan, M.C.(Rtd.)

Head, Biomedical Technology Wing
A. V. Ramani

Administrative Medical Officer
Maj. K. A. Hameed (Rtd.)

Financial Adviser and
Chief Accounts Officer P. I. Isaac

GENERAL

1980-1981 was a land-mark year in the life of Sree Chitra Tirunal Institute for Medical Sciences & Technology as it became an Institution of National Importance by an Act of Parliament in March, 1981.

The Act gave the Institute a national personality and defined its objectives as the development of biomedical technology, evolution of high standards in patient care and the organisation of integrated programmes of training in medical sciences and technology. The composition of the Institute Body which came into existence in terms of the Act is given in Annexure-1.

HOSPITAL WING

The hospital improved upon its volume of services for out-patients and in-patients over the previous four years as shown in figure 1.

In spite of the rising cost of patient care, the hospital was able to provide 56% and 45% of its services totally free of cost to inpatients and out-patients respectively (Figure 1). Free services included all services currently offered by the hospital including sophisticated procedures for diagnosis and treatment in cardiology, cardiac surgery, neurology and neuro-surgery.

The availability of up-to-date services in cardiology and neurology at no cost for poor patients and at modest rates for others has attracted a steadily increasing number of patients to the hospital as indicated in the Departmental reports. The fact that 10% of the total number of patients approach the Institute from States other than Kerala and that several come from as far away as Bangalore, Hyderabad, Denkanal and Delhi would suggest that its hospital services have received a measure

of recognition at the national level. The present level of services has, however, saturated the original hospital building which was, in fact, designed for a smaller and less complex work load. The work on the Setu Parvati Bayi Surgical Centre has therefore been expedited during the current year and the civil works on its nine-storeyed structure is already over. At the present rate of progress in electrification, airconditioning and other engineering services, the new Centre is expected to become partly available to patients during 81-82 and fully during 82-83. The availability of the new Centre will substantially expand the patient services and remove the present bottle-necks.

The library of the Hospital Wing grew by an addition of 2400 Sq.ft. during 80-81. It currently holds a stock of 2000 volumes relating to the biomedical areas of interest to the Institute and subscribes for over 300 scientific journals. Its services are utilised by the scientists of the Institute as well as postgraduate students from the professional colleges in Trivandrum.

The construction of quarters for the hospital staff made progress on a 5 acre plot at Kumarapuram which is within walking distance of the hospital. Eight 'B' quarters were occupied by younger faculty members and twenty-four in 'D' category by Class-IV employees. Rapid progress is being made in constructing twenty-four 'C' quarters for intermediate categories such as technicians and nurses. In spite of the poor availability of land, steps have also been taken to acquire one more acre adjacent to the existing campus for constructing much needed staff quarters for faculty and other staff.

A department-wise review of performance, in the Hospital Wing is given below. Their publications are given separately in Annexure 2.

REPORTS FROM DEPARTMENTS

Department of Anaesthesia

Dr. P. Mazumder, M.D., FFARCS, Prof.
Dr. K. Mohandas, M.D., Asst. Professor
Dr. V. Padmanabha Iyer, M.D., Asst. Prof.
Dr. A. S. Rajagopal, M.D., Lecturer
Dr. (Mrs.) Rout, M.D., Lecturer
Dr. B. K. Giridhara Rao, M.D., Lecturer

The volume of clinical work registered an impressive increase over the previous year as anaesthesia was administered for 871 procedures in cardiac and neurosurgery during 80-81 as against 646 during 79-80. Additionally, anaesthetic cover was provided for 262 investigative procedures. The Department also carried out pulmonary function studies whenever necessary and played a significant role in the post-operative management of patients.

The ICMR granted a research project on 'Parenteral alimentation by I. V. lipid' for 3 years with Prof. Mazumder as the principal investigator.

Division of Biochemistry

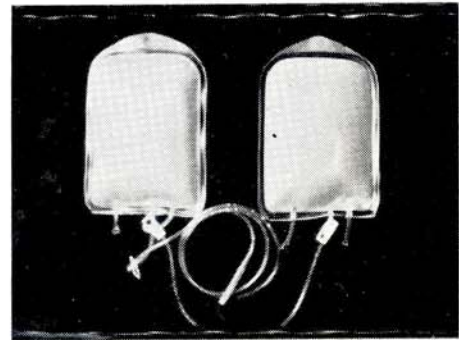
Dr. K. S. Iyer, Ph.D., Assistant Professor
Smt. Shanta A. George, M.Sc., Lecturer
Sri. Thomas Chandy, M.Sc., Scientist: Asst.

The Division provided round the clock services in clinical chemistry for the entire hospital and carried out nearly 25000 biochemical tests including sophisticated analysis such as blood-gases, serum lipids and enzymes. It also gave investigative support to ongoing studies in Endomyocardial Fibrosis.

Division of Blood Bank

Dr. P. A. Jayaprakash, MBBS, DIBT.
Dr. Hariprasad, M.B.B.S.

The Blood Transfusion service enrolled 1000 more voluntary donors in the Institute's panel by active interaction with various national service schemes of the colleges in the city. Solely based on the support of voluntary blood donors, the Blood Bank could meet 50% of the elective blood needs and all emergency requirements of the Institute. The remainder of the elective blood needs is currently required to be met by patients, friends or relatives. The Division continues to make motivational efforts to enlarge the base of voluntary donors.



Blood component therapy is practised at the Institute. A prototype of the double bag being developed by the Blood Bank and Polymer Technology Division is also shown.

The addition of a refrigerated centrifuge enabled the Division to provide blood fractions for component therapy and economise on the use of whole blood.



It has actively collaborated with the Technology Wing in the design and development of plastic bags for the collection, fractionation and storage of blood. These bags, double packs for blood fractionation in particular, are currently imported at great cost.

Department of Cardiology

Dr. R. P. Sapru, M.D., Ph.D., Professor

Dr. K. G. Balakrishnan, M.D., D.M.,
Asst. Professor

Dr. G. Venkatachalam, M.D., D.M.,
Asst. Professor

Dr. V. Ramakrishna Pillai, M.D., D.M.,
Lecturer

Dr. P. S. Bhat, M.D. Lecturer, (on leave
for DM)

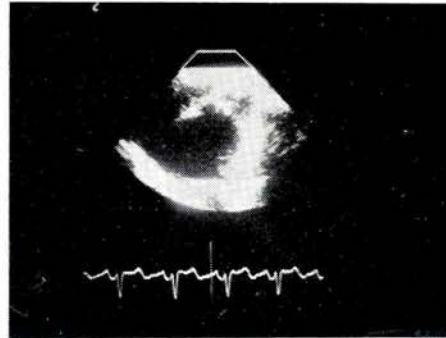
Dr. Thomas Titus, M.D. Lecturer
(on leave for DM)

Dr. K. Raman, M.D., Lecturer
(on leave for DM)

The Cardiac Clinic attended to 8600 patients of whom 2300 were new registrants. The inpatient admissions showed an increase of 30% over the previous year.

The special investigative procedures such as Cardiac Catheterisation including coronary angiography and echocardiography showed a similar increase of nearly 30%. 570 cardiac catheterisations and 1300 echocardiograms were in fact carried out during the reporting year.

In collaboration with the Division of Radiology, the Department made good progress in characterising endomyocardial fibrosis which is a regional cardiac problem of great importance. The availability of modern techniques such as 2-dimensional echo and coronary angiography has enhanced the value of these characterisation studies which have been reported in scientific journals.



Two-dimensional echocardiography in use to study the characteristics of endomyocardial fibrosis – an endemic disease.

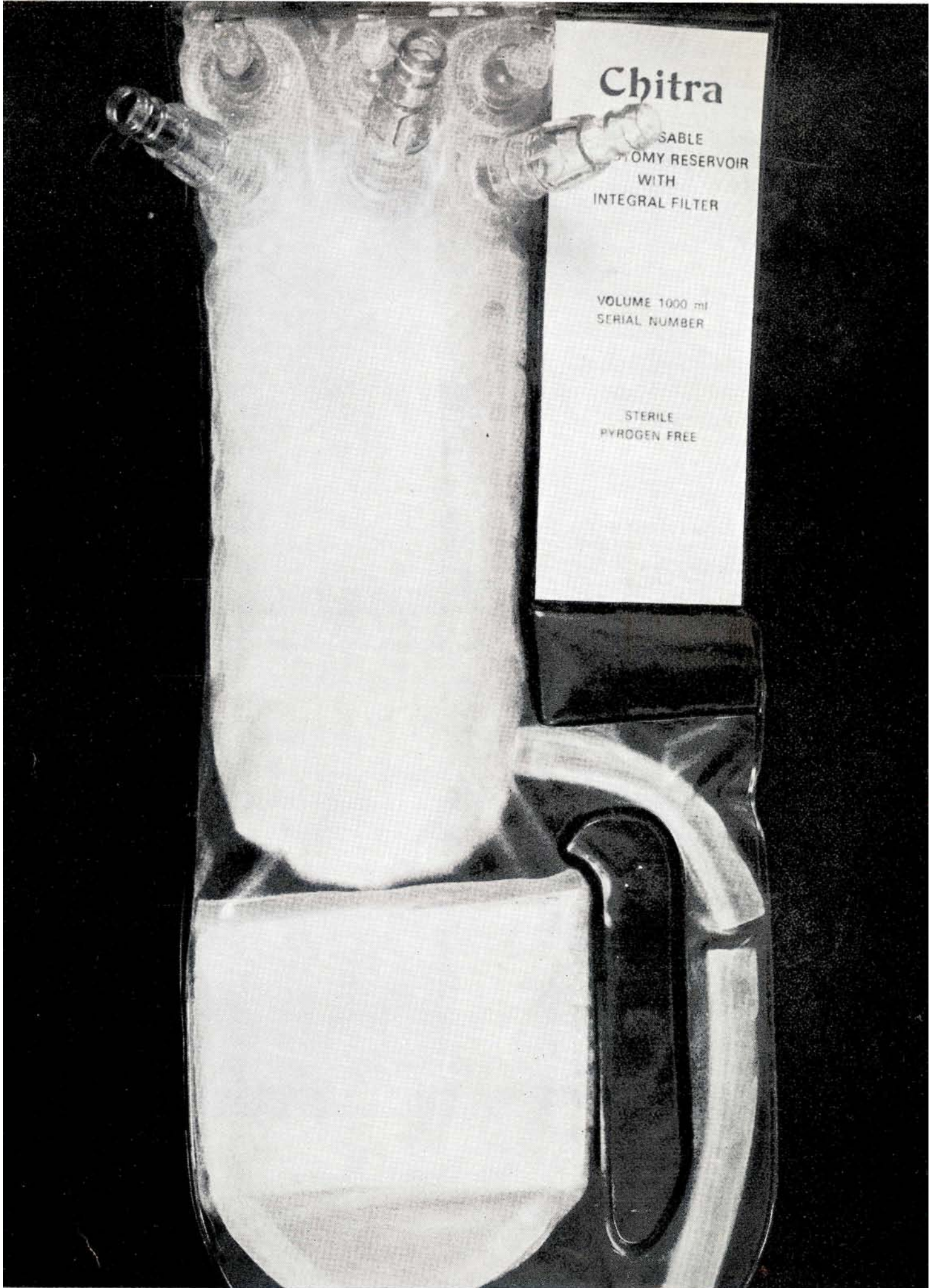


Chitra

DISPOSABLE
STOMY RESERVOIR
WITH
INTEGRAL FILTER

VOLUME 1000 ml
SERIAL NUMBER

STERILE
PYROGEN FREE



Cardiac Surgery

Dr. M. S. Valiathan, Ch.M., F.R.C.S.,
F.R.C.S.E., F.R.C.S.(C), F.A.C.C.,
F.A.M.S., F.A.Sc., Professor.

Dr. M. P. Mohansingh, FRCS(Edin)
FRCS(Eng.) Associate Professor.

Dr. A. K. Sharma, MS, M.Ch., Lecturer

Dr. Sankarkumar, M.S., Lecturer

Dr. Hishikar, M.S., Lecturer
(on leave for M.Ch.)

Dr. K. S. Neelakantan, M.S., Lecturer
(on leave for M.Ch.)

Dr. K. V. Krishnan, M.S, Lecturer.

The Department carried out 162 open heart operations and 238 other cardiac procedures during 80-81 with good results and registered a small improvement in the volume of services over the previous year. The operations carried out covered a wide range and included complex procedures such as double valve replacement and coronary artery bypass. The relatively high success rate and low cost of cardiac surgery added to the pressure for hospital admissions and created a long

waiting list for open-heart operations. This bottleneck in services is expected to be resolved greatly with the prospective opening of the Setu Parvati Bayi Surgical Centre.

The Department made good progress in collaboration with the scientists of the Technology Wing in developing a disposable oxygenator, cardiomy reservoir, vascular graft and a prosthetic heart valve as outlined below.

* Funded by the SERC, the disposable oxygenator project has made good progress over two years. The device is currently undergoing successful trials in sheep after its start from point zero in materials and technology two years ago.

* The cardiomy reservoir of indigenous development and construction has already passed in-vitro and in-vivo trials and found regular application in clinical open heart procedures. Its production is currently being discussed with other agencies.

* The development of vascular grafts in collaboration with South India Textile Research Association, Coimbatore received grant support from the Science and Engineering Research Council. After a series of in-vitro tests, the grafts were found satisfactory for trials in animals and the first few implantations for long term observation were carried out in pigs during the current year.

* The development of a prosthetic heart valve is by far the biggest challenge to biomedical engineering and cardiac surgery. The Department provided medical inputs at every stage of this project during the preceding four years and supported the development of a tilting disc valve which has reached the prototype stage. The progress in the above projects has been regularly reported in scientific journals and at professional meetings.

CHITRA CARDIOTOMY RESERVOIR

The Chitra Cardiomy Reservoir cum Filter is one of the first devices to be successfully designed, developed and clinically used at the Institute. It is a disposable plastic unit which is an essential part of the heart-lung bypass system. It serves to collect blood from intracardiac suction and pass it on to the oxygenator following filtration. The testing of its substrate materials, fabrication of components and experimental evaluation were carried out by different Divisions of the Institute.

Microbiology Division

Dr. J. Shanmugham, Ph.D., Assoc: Prof.

Jasper Daniel, M.Sc., Lecturer

M. Ravindranath, B.Sc, Scient. Assistant

Molly Thomas, M.Sc., Scientific Assistant

During 80-81, the bacteriological tests for patients increased by 40% in volume. This was partly due to the introduction of new tests such as determination of ADN-ase for the laboratory diagnosis of rheumatic fever, streptozyme test for Group A streptococcal antibodies, gentamycin assay in CSF and detection of type-specific coxsackie-B-viral antibodies by neutralisation test in VERO cell line.

The current research projects of the Division relate to a study of viral encephalitis (in collaboration with SAT Hospital for Women and Children, Trivandrum) and comparative evaluation of various immunologic techniques for detecting Australia antigen in human sera. The Division received a grant from the Department of Science & Technology for an experimental study of pancarditis due to coxsackie-B-viruses in view of the known propensity of these viruses to attack cardiac tissues. It also collaborated with the Department of gastroenterology, Medical College, Trivandrum in an ICMR funded project on the viral aetiology of chronic pancreatitis.

Neurology

Dr. Vimala Virmani, M.A. (Psy)
F.R.C.P.E., F.A.M.S., Visiting Professor

Dr .P.K.Mohan, M.D., D.M., Asst. Prof.

Dr. P.K. Saha, M.D., Lecturer (on leave)

Dr. P. P. Ashok, M.D., Lecturer(on leave)

Dr. Devabavus Chattam Pillai, M.D.,
Lecturer.

Dr. Tharakan, M.D., (on leave for DM).

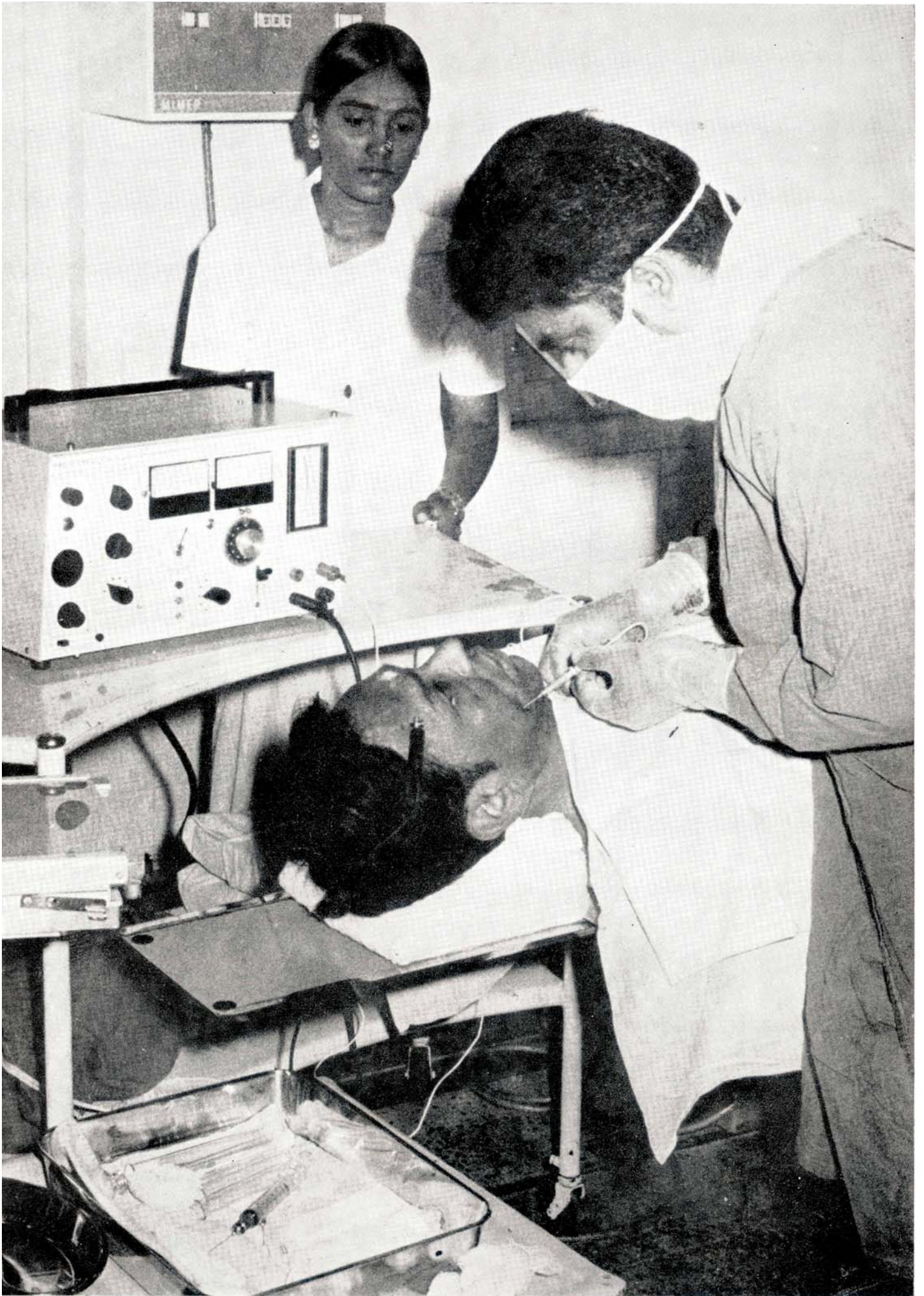
The out-patient attendance during 80-81 recorded 1500 patients which contrasts sharply with the yearly attendance of 196 in 1976. Nearly 50% of those attending the out-patient clinic were subsequently hospitalised for specialised investigations and treatment. These investigations included over 500 sophisticated procedures such as electroencephalography and electromyography.

In veiw of the high incidence of infections of the central nervous system, the Department initiated a project in collaboration with the Divisions of Pathology and Microbiology to study the immunopathologic basis for their genesis and control. Preliminary investigations by Departmental staff also revealed skeletal muscle dysfunction in patients with endomyocardial fibrosis. These findings were reported at national professional meetings.

A paper on "Effect of exercise on Peripheral Nerve Conduction velocity in Coarctation of Aorta and other Occlusive Vascular Disease" from the Departments received an award from the Neurological Society of India.

RADIO FREQUENCY LESION IN NEURO-SURGICAL TREATMENT

Trigeminal neuralgia is a very painful condition which afflicts many patients. The older methods of its treatment included injection of chemicals or a surgical operation on the diseased nerve site in the head. The modern method is simple and safer. The affected nerve fibres are located with a special needle and destroyed by inducing a radio frequency lesion.



Department of Neurosurgery

Dr. George Mathews, FRCS(C) Professor

Dr. Damodar Rout, MBBS, M.S., M.Ch.,
Associate Professor

Dr. S.M. Pillai, M.S., Lecturer

Dr. Ashok Nayak, MS, Lecturer

The clinical services registered all-round increase as shown by the following comparative figures:

	1979-80	1980-81
Neuro Cases	1100	1650
Admissions	790	930
Bed occupancy	65%	89%
Neurosurgical procedures	250	384

As the only Department which offers radiofrequency lesion for treatment, the Department attracted a large number of patients with trigeminal neuralgia which is a most painful disease. In view of the frequency of spinal-cord lesions in the region, the Department organised a one-day seminar on the subject and opened a special surgical unit for spinal problems. It collaborated with the Division of Radiology in evolving newer diagnostic techniques such as dynamic lumbar myelography and orbital venography which have been reported at scientific meetings.

Division of Neurochemistry

Prof.D.K.Basu, Ph.D., Professor

Appukkuttan, M.Sc., Scientific Assistant

The Neurochemistry Division provided important diagnostic assistance to the Department of Neurology by estimating lysosomal enzymes in urine samples of patients with suspected mental retardation and confirming a positive correlation between elevated sialic acid levels in CSF and pyogenic meningitis.

The Division accepted four research fellows for doctoral studies and received two project grants from Department of Science and Technology and CSIR respectively. The DST sponsored project has as its main objective the development of enzyme engineering for clinical applications. Initially, efforts are being made to develop an enzyme linked immunoassay system for estimating circulating creatine-kinase which will be superior to the physico-chemical methods in current use. The project sponsored by the CSIR is aimed at the utilisation of hospital waste products for the preparation of enzymes. Two lysosomal enzymes—beta galactosidase and alpha-mannosidase—have already been extracted and purified from placental tissue as the first stage in making them available for research and diagnostic use in other laboratories.

The Division added an LKB Rack-Beta-Liquid Scintillation counter, Liquid chromatograph, High-speed omnimixer and an automatic fraction collector to its range of laboratory equipment during the current year.

Pathology

Dr. V. Radhakrishnan, M.D., Asst. Prof.

Dr. Rachel Mathai, M.D., Lecturer

Dr. C. Chandrasekhara Kartha, M.D.,
Lecturer.

The Division made an effective contribution to the hospital services by providing histopathological reports including frozen sections and maintaining an autopsy rate of 30%. It also placed at the disposal of patients round the clock laboratory services in hematology and clinical pathology. The total of laboratory investigations registered an increase of 24% over the previous year and numbered nearly 40000.

The research programmes of the Division covered a wide area ranging from biocompatibility of materials to endomyocardial fibrosis and fungal infections of

the central nervous system. The main projects are outlined below:

- (i) Study of the role of filariasis in the causation of endomyocardial fibrosis and the development of a rodent model for filariasis.
- (ii) Effect of prolonged eosinophilia on the myocardium (Funded by ICMR)
- (iii) Immune mechanisms of host in experimental fungal infections of the central nervous system.

Division of Radiology

Dr. K. Sasidharan, M.D., Asst. Professor

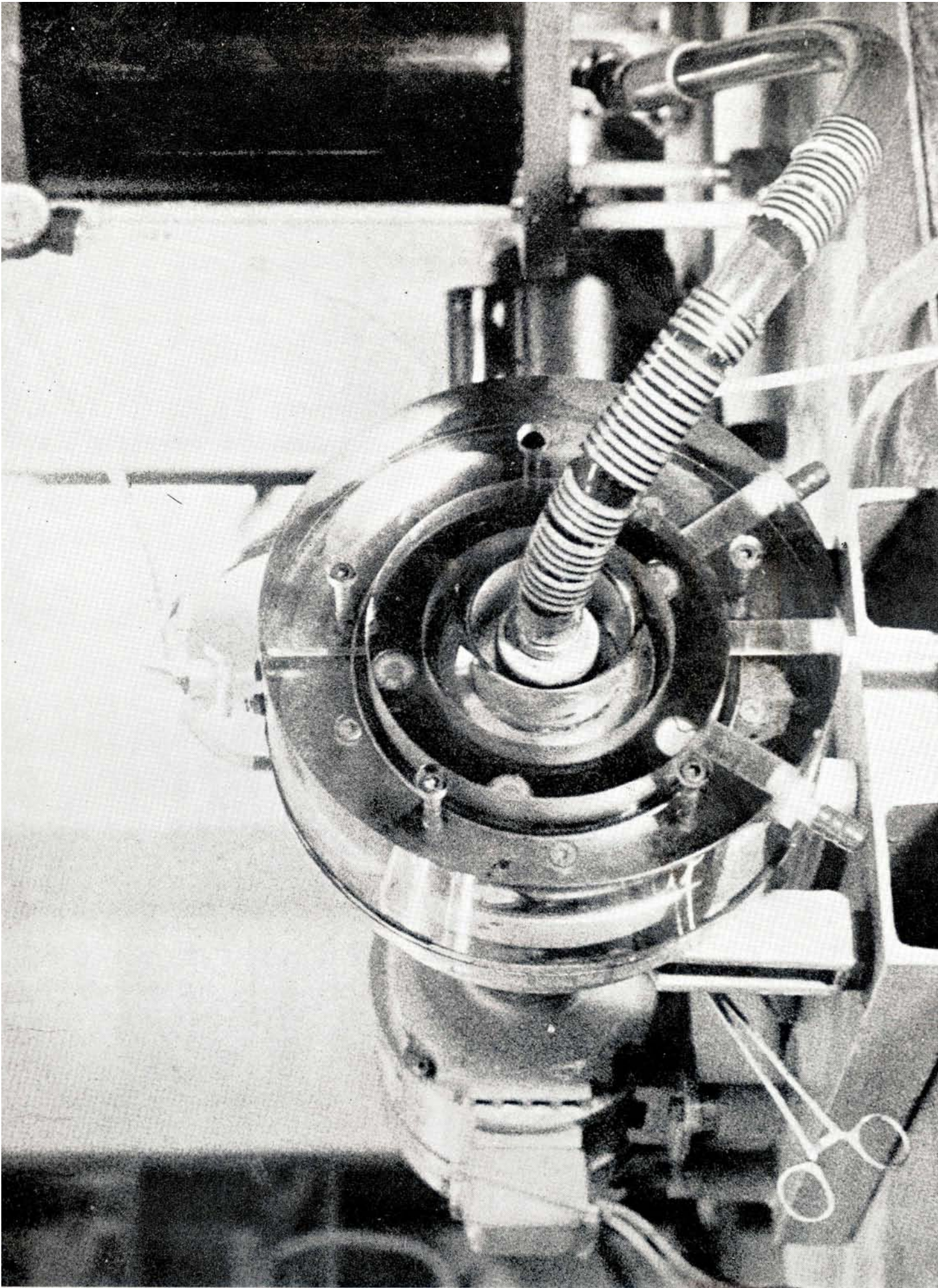
Dr. V. R. K. Rao, M.D., Assistant Professor

Dr. Ravikumar, M.D., Lecturer

Dr. Bhat Venkataraman, M.D., Lecturer.

The increase in patient load was reflected in the radiologic investigations which registered an average increase of 30% over the previous year. The cardiac radiologic procedures including coronary arteriography, angled views and other specialised techniques remained standard practice during 1981. The Division contributed significantly to the study of endomyocardial fibrosis and reported the characteristic findings of the disease in collaboration with the Department of Cardiology. The unique collection of radiographs of endomyocardial fibrosis is being published in the form of a monograph.

Neuro radiologic investigations broke new ground and introduced new procedures for spinal angiography, orbital venography and dynamic myelography which have attracted professional notice. The neuro-radiology group also initiated a project to publish in atlas form its excellent collection of conray ventriculograms which have special relevance in developing countries.



BIOMEDICAL TECHNOLOGY WING

The Biomedical Technology Wing made substantial progress during 80-81 in so far as several of its units which had been functioning in make-shift accommodation could move into their permanent location at the Satelmond Palace campus. The Library in the Palace building continued to grow with the addition of 710 books, 206 bound periodicals and 31 new journals in the field of biomedical technology. The development of the Palace grounds also made good progress with the planting of over 750 trees, laying of rose and orchid gardens and other imaginative activities under the supervision of a retired agricultural scientist.

The Engineering Block on the eastern slope of the Satelmond Palace mound was completed and handed over to the Departments of Biomaterials science and Biomedical Engineering. The construction of the Block for Toxicology and Vivarium proceeded on the western slope and was expected to become available for regular use within a period of three months. The incinerator was commissioned for the hygienic disposal of not only animal wastes from the Biomedical Technology Campus but also for hospital wastes.

The building for housing a Panoramic Batch Irradiator (Panbit) approached completion under the supervision of BARC authorities who expect the unit to become operational during 81-82. The advent of this unit would greatly strengthen the R & D programmes in biomedical devices.

The Biomedical Technology Wing was visited by Prof. David Annis, Director of Bioengineering Unit, University of Liverpool, U. K. and Prof. David Neumann, Department of Mechanical Engineering, University of Toronto whose seminars were well received by the faculty.

A departmentwise report is given below:

WEAR TESTER FOR A PROSTHETIC HEART VALVE

Before a prosthetic heart valve is tested in animals, it must be judged to have durable function for a minimum period of 5-10 years. This assurance of durability is obtained by inserting the valve in a wear tester which pulses it at 800 per minute for days, weeks, months and years. Naturally the experiment is as much a test for the wear tester as for the valve.

The wear tester shown here with valves mounted inside was designed and fabricated in the Biomedical Engineering Department. It has stood the test well and already confirmed the durability of the Chitra Valve for two years at the time of this report.

Department of Biomaterials Science:

(i) *Laboratory for technical evaluation of biomaterials:*

Dr. V. V. Bhujle, Ph.D., Polymer Chemist.

Smt. Prabha Damodaran Nair, M.Sc.,
Scientific Officer

Sri. Sreenivasan, M.Sc., Scientific Officer

This laboratory which had been functioning in a room at the hospital complex, moved into a spacious facility and quickly re-established and streamlined the procedures for evaluation of biomaterials.



Equipped with a wide range of sophisticated equipment for the study of transport, thermodynamic and mechanical properties under different conditions, the laboratory screened the candidate materials used by different groups and served the research needs of a few other organisations as well.

(ii) *Laboratory for Protein—Polymer Studies:*

Dr. C. P. Sharma, Ph.D., Polymer Chemist.
Sri. Kalliyankrishnan, M.Sc., Scientist:Officer

This laboratory which was set up during the current year is devoted to the study and manipulation of polymer surfaces with the primary object of making them biocompatible. It was awarded a DST funded project for the development and evaluation of biocompatibility of polyurethanes. Apart from equipment for routine work, the laboratory has special items like contact angle goniometer, 125 Gamma counter etc. in regular use.

Its second grant proposal for Development of a New Antithrombogenic Polymer Surface and their Interaction studies with blood proteins at the interface has been approved in principle for funding by the Department of Atomic Energy.

(iii) *Laboratory for Thrombosis:*

Dr. M. Jamaluddin, Ph.D.,
Scientist in charge

Smt. Lizy Paul, M.Sc., Scientific Assistant

This unit, headed by a biochemist, is designed to study thrombosis and blood

POLYESTER FABRIC

Polyester fabric is extensively used for intracardiac repair and the fabrication of the sewing ring of artificial heart valves. This fabric must be durable and biocompatible. In this photograph, the cross sections of indigenously developed polyester yarn and the smooth ingrowth of host connective tissue into the interstices are clearly seen.

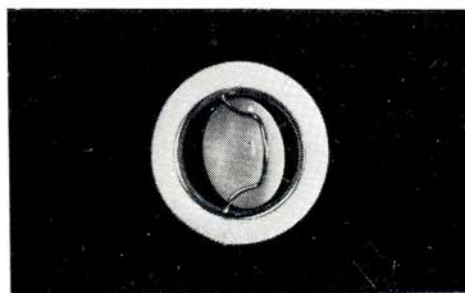
prosthetic interactions which hold the key to the development of blood compatible materials. It came into existence during the last month of the current year and is not fully established yet. Prior to his formal accession to the faculty, the scientist-in-charge had submitted a project on the study of the structural and conformational aspects of protein-prosthesis interactions which he proposed to carry out in the Biomedical Technology Wing. This project has since been sanctioned for funding by the Department of Atomic Energy.

Department of Biomedical Engineering

(i) *Division of Internal organs:*

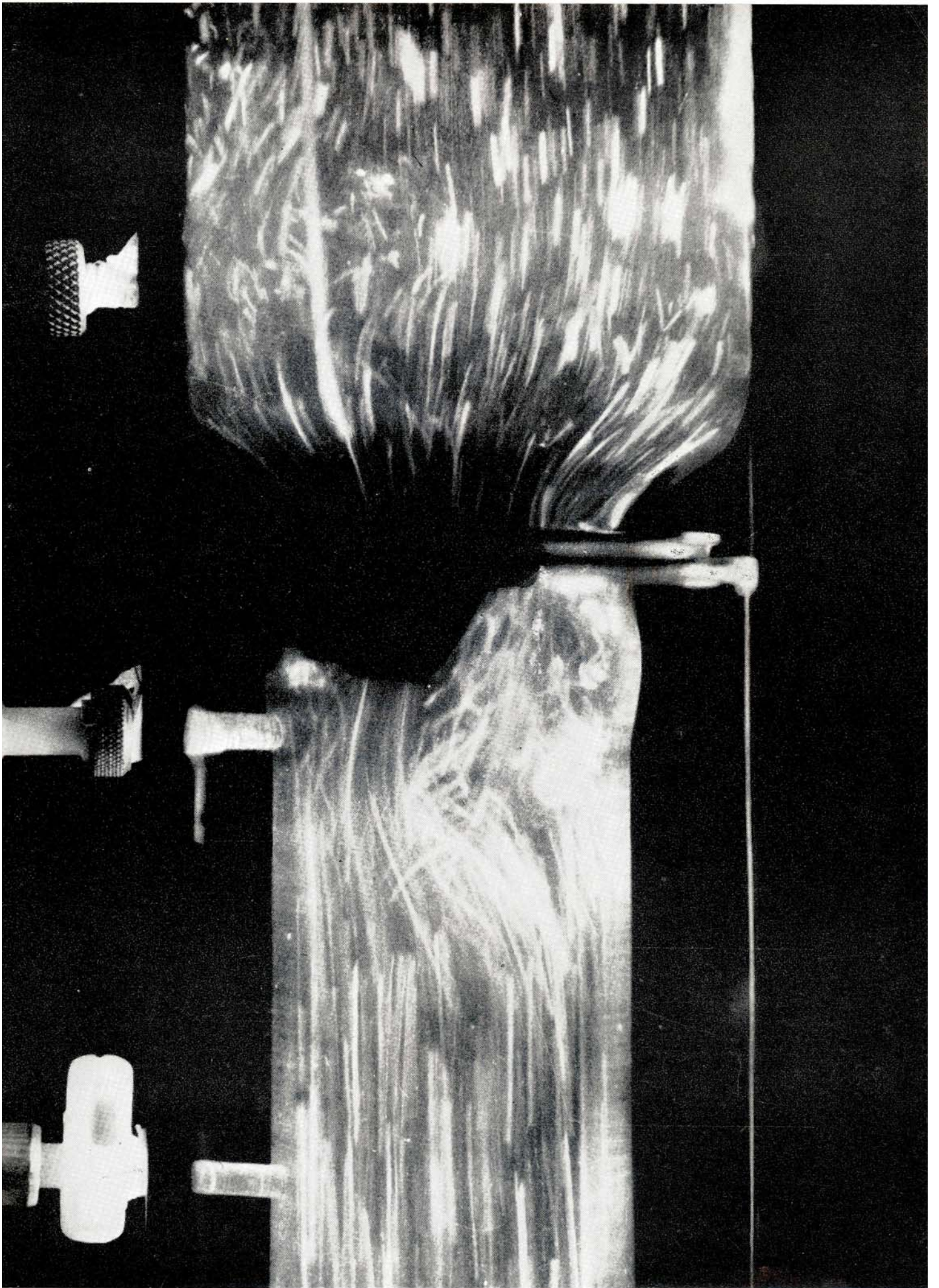
Sri.G.S.Bhuvaneshwar, B.Tech., MS.,
Biomedical Engineer.

The challenge of developing a prosthetic heart valve was met by this Division which made progress on several fronts. With the co-operation of the Tool Room Division, fixtures and dies for wire, disc and cage polishing, wire bending, cage drilling and welding were designed and an improved model of an accelerated wear tester commissioned. The first batch of fully assembled valves was tested, the problem of fatigue failure of major struts was identified and remedial measures evolved during the current year.



Chitra Valve—prototype

It features a valve housing of titanium, tilting disc of polyacetal and sewing ring of polyester. Its haemodynamic function and durability compare favourably with the best models from abroad.



This group was sanctioned a DST project on the development of vascular grafts in collaboration with the South India Textile Research Association of Coimbatore. After a series of engineering experiments and characterisation tests on preliminary samples, a few grafts were successfully implanted in pigs for accelerated in-vivo evaluation. The long term outcome of the graft implants are proposed to be evaluated in a year to 18 months.

(ii) *Division of Extracorporal Devices*

Sri. V. S. Venkatesan, B.E.,
Biomedical Engineer.

This Division made notable progress and in collaboration with the Department of Cardiac Surgery, has developed and produced on laboratory scale a soft shell cardiomy reservoir and a cardiomy reservoir with integral filter after extensive engineering and animal trials. These

devices are currently undergoing limited clinical trials and have set the pace for the development of technology at the Institute.

The major device, a bubble oxygenator, being developed by this group has reached the stage of ex-vivo trials after a long series of successful tests in the engineering and in-vivo field. It has outperformed imported devices of similar description in almost all respects and expects to enter clinical trials early next year.

A spurt in the activities of this Division became possible because of the recently commissioned air conditioned clean room for fabricating devices.

(iii) *Division of Polymer Technology*

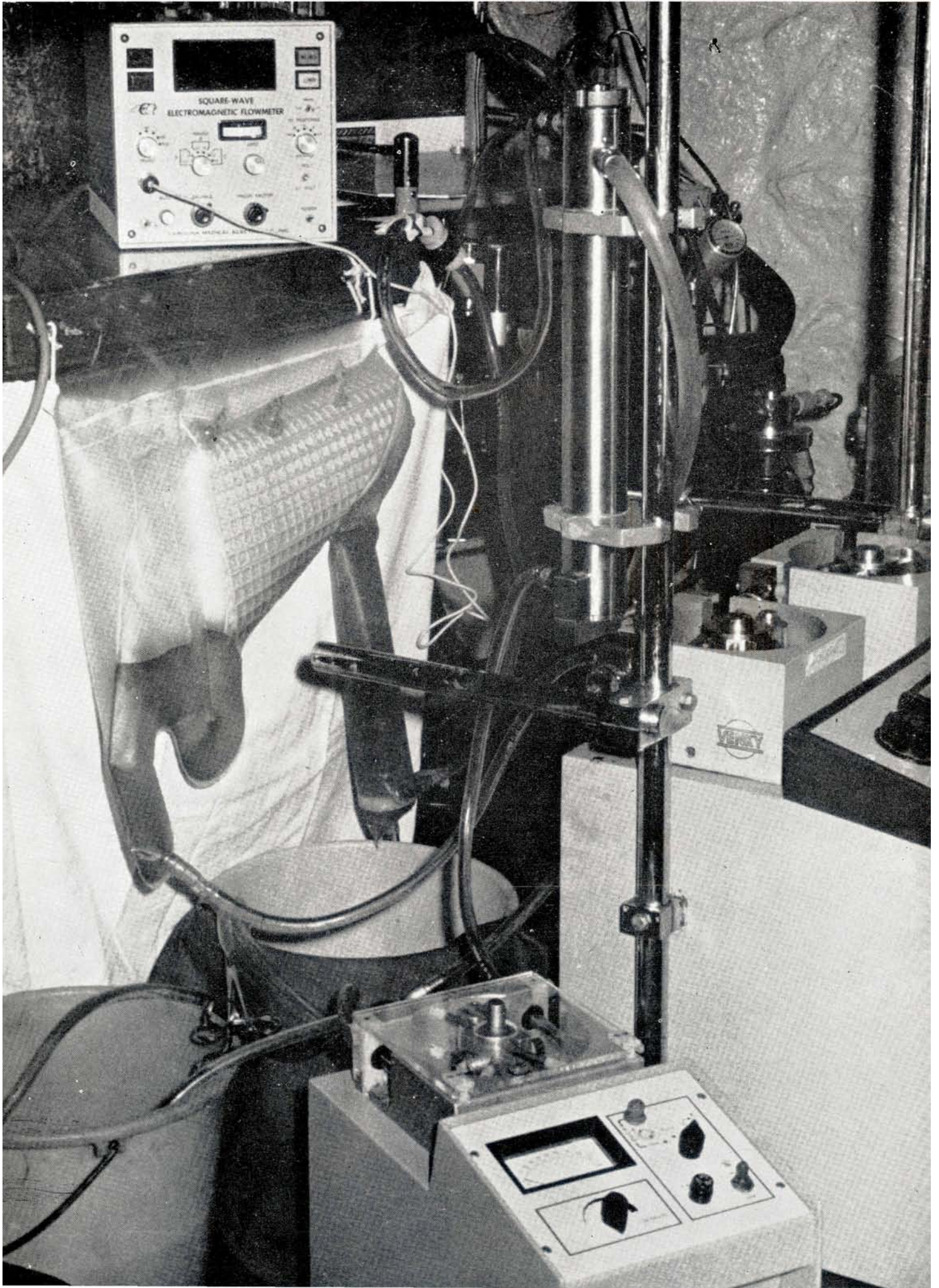
Sri. S. N. Pal, M.Tech., Chem. Engineer

In collaboration with the Blood Bank and laboratories of the Department of Biomaterials, this Division initiated a new project for the development of plastic bags for blood storage and fractionation in view of their acute need in the country. This effort was facilitated by the prior experience of the Division in designing and fabricating components such as connectors, caps, airvents and spargers for ongoing projects. In its attempts at producing quality assured compounds, it successfully exploited the common kitchen mixer as an important tool. The negligible cost, small batch sizes and reproducibility was well proved by scaling up from a few grammes on the kitchen mixer to 10 kg. lots on the high speed pilot plant mixer.

The Division has in operation an injection moulding machine, extruder, melt-index tester, Rheocordes, High speed mixer, Impact tester and Hardness tester and other essential equipment. A pilot plant for batch preparation of polymers is also being set up.

FLOW PATTERN THROUGH CHITRA VALVE

A crucial stage in the development of a prosthetic heart valve is its evaluation in a pulse duplicator which simulates cardiac action. The pulse duplicator is essential to determine the opening and closing functions, flow pattern and pressure gradients of a given valve under test conditions. In this flow photograph, the Chitra tilting disc valve can be seen to produce central flow from the left ventricular test chamber on the left to the aortic conduit on the right.



(iv) *Tool Room Division*

Sri. O. S. Neelakantan Nair, B.Sc.,
(Mech. Engg.) Tool Room Engineer

Fully-equipped to undertake mould making and other complex procedures, the Tool Room Division was responsible for making the dies, fixtures and special tools for the prosthetic valve and oxygenator projects. Other contributions to the valve project included the making of special purpose machines for wire sizing and wear testing.

The Division facilitated the organisation of Vivarium by fabricating 50 large animal cages coated with non-toxic epoxy paint. Its latest acquisition is an electric discharge machining system for producing complex shapes in hard alloys. This machine has already been successfully used in fabricating a prosthetic valve housing with an integral strut.

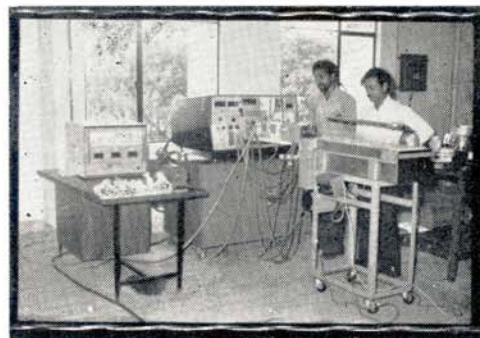
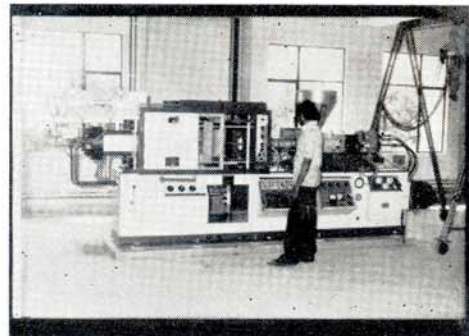
Division of Materials Toxicology:

Dr. P. V. Vedanarayanan, B.V.Sc., Ph.D.
Senior Materials Toxicologist

Dr. A. C. Fernandez, Ph.D., Scientist

Sri. K. Rathinam, M.Sc., Scientist

This Division is charged with the important function of evaluating the toxicity of the materials being developed or used by various groups. During 80-81, the Division moved into its permanent location in the Biomedical Technology Wing with ample facilities for small animal breeding care and procedures. Its contributions in testing candidate materials formed the basis for the development of cardiomy reservoir, vascular graft and other devices which were mentioned earlier.



DISPOSABLE BLOOD OXYGENATOR

A disposable blood oxygenator carries out the function of the lung during open heart operations. It has several parts which must be individually tested and assembled before functional evaluation. In this photograph, a blood oxygenator developed by the Biomedical Engineering Department is undergoing in-vitro trial. The device has completed these and other exacting tests successfully and is awaiting clinical trial.

Polymer Technology Division

Two views of the Division which develops and processes biomedical plastics.



The Materials Toxicology Group was awarded a DST funded project for the evaluation of cytotoxicity as a sensitive method for assessing the biocompatibility of materials. Its laboratories are scheduled to add to their impressive equipment an Atomic Absorption Spectrophotometer and Cryogenic tissue culture systems which will extend the range of their performance.

TOOL ROOM

Tool Room Division is an important unit in the Biomedical Engineering Department which designs, fabricates and tests biomedical devices. Equipped with HMT and other Indian machines, the Tool Room makes a major contribution to biomedical technology by making moulds and undertaking complex fabrication jobs including unconventional machining.

BIO-PLASTIC COMPONENTS

The complex devices which are used in hospitals consist of many parts which must be made with great accuracy and purity. The polymer Technology Division of the Institute is responsible for the preparation and processing of plastic formulations. It provides major support to the biomedical engineering programmes.

ARTERIAL PROSTHESIS FROM POLYESTER YARN

Prosthetic replacement of arteries which are damaged beyond repair by trauma or disease is common in contemporary surgical practice. The arterial prosthesis is a crimped, seamless tube which may be woven or knitted from Polyester yarn. The characterisation of the yarn, fabrication of the prosthesis and subsequent trial in pigs are complex and time consuming, the porcine trial alone requiring two years. A polyester arterial prosthesis developed jointly by South India Textile Research Association, Coimbatore and Sree Chitra Tirunal Institute for Medical Sciences & Technology has been found to meet all material requirements in a series of in-vitro tests. It is currently being implanted in the thoracic aortic position in pigs for longterm evaluation. The prosthesis in position and the animal on the first post-operative day can be seen.

Division of Vivarium

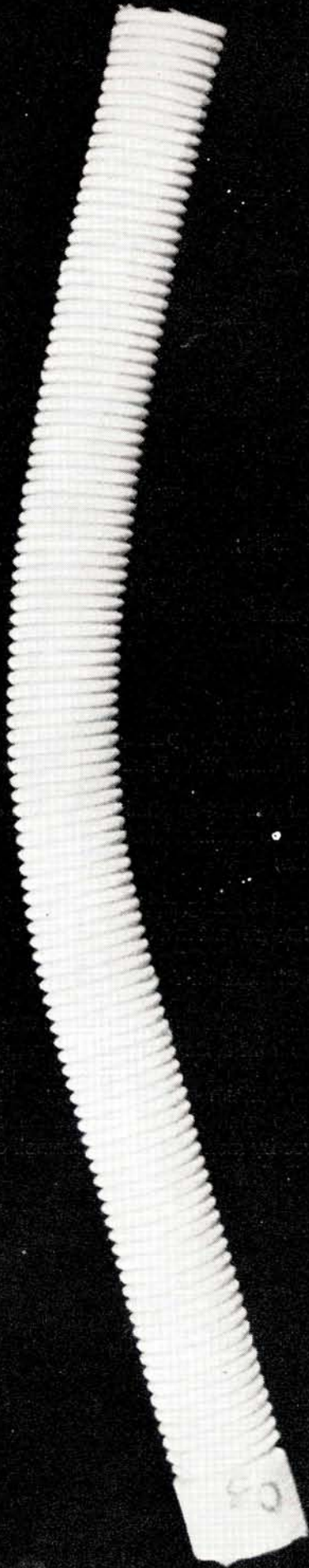
Dr. Arthur Vijayan Lal, B.V.Sc.,
Veterinary Scientist

This Division consists of housing for dogs, sheep, pigs and smaller animals and laboratories for investigations and surgical procedures. Apart from ensuring high standards of animal care, it has the responsibility to provide investigative support in evaluating the safety and biocompatibility of materials and devices which are designed for human applications.

Pending the availability of permanent quarters in the modern vivarium block the Division continued to maintain its animals in several Palace outhouses which had been suitably repaired and altered. Similarly, the outhouse room functioned as a well-equipped operating rooms, biochemistry laboratory, sterilisation room and other technical facilities. The degree of sophistication of these 'make shift' facilities will be readily apparent from the fact that procedures such as cardiopulmonary bypass, evaluation of intravenous lipid and blood-gas estimations had been routinely and successfully carried out in these rooms for over two years.

During 80-81, the Division played a major role in the preclinical evaluation of a disposable oxygenator in sheep, vascular graft in pigs, intravenous lipid and dental materials in dogs. In all these procedures, the veterinary scientist was an active member of the scientific team and a co-author of the resultant publications.

The Division also provided regular inputs into the construction and imminent commissioning of the vivarium block with modern facilities for animal care and experimental procedures.



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Annexure 1

THE INSTITUTE BODY

The Institute shall consist of the following members, namely:—

- (a) The Vice-Chancellor of the Kerala University, ex-officio;
- (b) The Director-General of Health Services, Government of India, ex-officio;
- (c) The Director, ex-officio;
- (d) Four members to be nominated by the Central Government to represent respectively the Departments or, as the case may be, Ministries of that Government dealing with Science and Technology and Health; Finance and Education.
- (e) Two members to be nominated by the Government of the State of Kerala to represent respectively the Departments or, as the case may be, Ministries of that Government dealing with Planning, Science and Technology and Health.
- (f) Three scientists of whom two shall be medical scientists and one shall be a social scientist, to be nominated by the Central Government in the manner prescribed by rules;
- (g) Three scientists representing engineering and technology to be nominated by the Central Government in the manner prescribed by rules;
- (h) The Head of the Biomedical Technology Wing of the Institute, ex-officio;
- (i) Three representatives of the medical faculties of Indian Universities to be nominated by the Central Government in the manner prescribed by rules; and
- (j) Three members of Parliament of whom two shall be elected from among themselves by the members of the House of the People and one from among themselves by members of the Council of States.

Annexure 2

PUBLICATIONS

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 16. Venkatesan.V.S., G.Arthur Vijayan
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FIGURE 1

