There has been much discussion in these columns and outside, of the state of science in the universities and how to improve it. One laudable effort in this direction was the setting up of the Inter-University Consortium for DAE Facilities at Indore. Without much fanfare, a good beginning has been made in encouraging and facilitating high-quality experimental work by university staff and research students. The following report on the Annual Day at this Centre gives some feel of the nature of the efforts there, as well as the visitors, often working in other areas, who have already been attracted to Indore. One hopes this process will continue and give rise to flourishing experimental activity in an exciting academic atmosphere in the years to come.

–Editors

Annual Day of the Inter-University Consortium for Department of Atomic Energy Facilities

The Annual Day of the Inter-University Consortium for DAE Facilities was celebrated on 14 December 1994, at Indore. A one-day seminar on Science in India – Some Facets' was organized on this occasion. At the inaugural function, Prof. R. Srinivasan, Director of the IUC-DAEF, gave a brief report of the progress achieved in the last one year at the three centres of the IUC-DAEF. There are 70 on-going projects of university users at the Dhruva Reactor, Bombay, the Variable Energy Cyclotron at Calcutta and the low-energy accelerators at IGCAR, Kalpakkam. The work on the photoelectron spectroscopy beam line is progressing well and the PES beam line and spectrometer will be put on the synchrotron radiation source INDUS 1, which is expected to be operational in CAT by the middle of next year. A number of in-house facilities have been added in Indore and Calcutta, including facilities for doing work down to liquid helium temperature. There is a constant stream of university users on these facilities. In the last one year IUC-Indore centre has conducted seven workshops/short-term courses/discussion meetings and IUC-Calcutta centre has conducted six such meetings. Participants have been drawn from universities in different parts of India.

In his presidential address, Dr D. D. Bhawalkar, Director of CAT, traced the genesis of IUC-DAEF. The Department of Atomic Energy welcomed the idea of closer co-operation with the universities and has thrown open the major national facilities set up by DAE for the use of scientists from the universities through the IUC-DAEF. He was happy with the progress achieved by the IUC-DAEF so far and promised all co-operation from the DAE establishments to the efforts of IUC-DAEF.

Prof. Ramaseshan, in his keynote address, pointed to the dwindling resources for higher education and research in the universities. He said that unless higher education and research in universities are supported, the country will face a critical situation in the near future. He lauded the efforts of IUC-DAEF in setting up good measurement facilities in the Indore and Calcutta centres and hoped that university scientists would make full use of the opportunities provided to come out with quality experimental work. He said that, in the past, a culture of building equipment existed among the physicists in the country. Physicists raised in such a culture have played a crucial role in the development of atomic, space and defence research in the country. In the last few decades there has been greater and greater reliance on importing equipment for research in the universities and other institutions, and development work was confined to specialized agencies and laboratories. This is the major reason for the decline of experimental research in the universities. Prof. Ramaseshan said it is not enough to provide good facilities for measurement at a place like IUC-DAEF for use by scientists from universities. The IUC-DAEF should involve university people in the development of instruments and equipment. He also said that the training of scientists should be the job of universities. He wondered if the Department of Atomic Energy had not started its own training school but had helped the universities to run such training programs, perhaps there would have been a greater involvement of university researchers in DAE programs. Wishing the IUC-DAEF success in its efforts, he inaugurated the one-day seminar on 'Science in India – Some Facets'

In this seminar Dr Dasannacharya from BARC traced the development of neutron beam research in India from the late fifties when the APSARA reactor and later the CIRUS were built. He described how a variety of neutron spectrometers were built around these reactors and later around DHRUVA, and the improvements that have been made in these spectrometers to reduce the data collection time and to get a higher resolution. He also referred to some of the important results achieved in the last nearly three decades using the indigenously developed spectrometers.

Dr Bhawalkar dwelt on the development of laser technology in CAT. He described the fabrication of a high-power copper vapour laser and how the technological problems involved were solved. A nitrogen laser was developed and applied successfully for the treatment of tuberculosis and another for the detection of uranium by fluorescence to 0.2 parts per billion. A nitrogen laser is being used for detecting cancerous cells. A 2 GW 6 ns Nd-glass laser has been constructed in CAT for XUV laser-plasma studies. A laser power meter has also been developed.

Dr Rangarajan, Director, Master Control Facility of ISRO at Hassan, spoke about the Indian Space Programme – past, present and future. He talked about the satellite development programme of ISRO, which has resulted in improved communications and rural education, and the invaluable contribution of remote sensing to problems of mineral exploration, water resource and crop management, etc. He also dwelt on indigenous development of satellite launch vehicles.

Dr Kembhavi gave a succinct description of India's contribution to astronomy

from days of yore. He talked about the excellent work done on observational astronomy by the Kodaikanal observatory in the early days of astronomical research in India. He dwelt on the programmes of the Indian Institute of Astrophysics in optical astronomy, the TIFR in X-ray and radioastronomy and the Raman Research Institute in radioastronomy. The GMRT being built by the National Centre for Radioastrophysics at Poona is expected to yield exciting results about the origin of the universe. He also talked about the establishment of IUCAA and its role in promoting the study of astrophysics in universities.

Dr K. V. L. Sarma of the TIFR introduced the audience to the ultimate constituents of matter, namely the leptons, quarks and gluons. He described the standard model and spoke about the discovery of the top quark announced recently. Experimental research on elementary particles involves very costly and huge accelerators and a very large team of scientists, engineers and technologists. Though our country cannot afford to build such machines, our scientists are actively participating in such research in CERN and at other big accelerator laboratories in USA.

Dr B. L. Saraf dealt with the pressing problem of the deteriorating condition of laboratory instruction in the educational curriculum of many universities. He said that no attention is being paid to the improvement of experiments and there is no money to maintain equipment in good condition. He described some attempts being made to set up advanced experiments in nuclear physics at the M Sc level in a few colleges in Madhya Pradesh under a Physics Education project sponsored by the UGC and managed by the IUC-DAEF.

The IUC-DAEF had also organized a display of charts, photographs, etc., highlighting its progress in the centres at Bombay, Indore and Calcutta.

R. Srinivasan, Inter-University Consortium for DAE Facilities, Indore

Indian initiative in liquid crystal research*

We are living in the age of information technology (IT), which is nothing but a combination of computers and communication. Now we are witnessing a further coming together of audio and video technologies also and this combination of evolving into what is called multimedia. A significant fact of the IT scene is the continuous evolution of new technologies and also their increasingly ubiquitous application. In fact one can say that there is no area of manufacturing or services where you cannot apply IT and get benefits.

Man has been called a tool-making animal. We can classify human beings as *Homo spiritualis*, *Homo sapiens*, *Homo ludens* and *Homo faber*, displaying respectively, the spiritual, the reasoning, the playful and the tool-making aspects of man. When man has to interact with a machine, especially in areas like IT, there is a need for information display by the machine, which is done using display devices. Today's function inaugurating the Centre for Liquid Crystal Research is an index of India's determination to be a part of the exciting new area of display devices.

There are six basic types of displays available in the international market. These are: cathode ray tubes, liquid crystal displays, light-emitting diodes, plasma display panels, vacuum fluorescent displays and electrode emission displays. Some of these are specialized displays. Except for the conventional cathode ray tube (CRT), with which all of us are familiar, thanks to computers and television sets, all other displays are flat-panel displays. The world over, there has been a growing interest in the development of advanced flat-panel displays. Even for the CRT, there have been attempts to develop and manufacture flat CRTs.

A look at the different types of displays indicates the increasing presence of non-CRT devices, as is obvious from Table 1.

The global display market is expanding rapidly. The total global display market is expected to be 11.6 billion and this is likely to go up to 38 billion in the year 2000. LCD devices are likely to have higher volume of the market compared to CRT beyond 1996. In the global display market, the large Japanese companies are dominating in all segments of displays. Due to the special features of each display, each of them caters to a niche market apart from generalized applications.

Table 1. Percentage of revenues by display tubes for 1987–97

Year	Type of display					
	CRT (%)	LCD (%)	EL (%)	ACP (%)	DCP (%)	LED (%)
1987	79 9	8 5	0 5	1.7	3 5	5.9
1988	79.8	8.5	0 5	1 8	3.5	6 0
1989	79 4	8 6	0 6	1.8	3 6	6.0
1990	79 0	8 9	0 6	1.9	3 6	6 0
1991	78 4	9 4	0.7	1 9	3 6	6 0
1992	77.4	10 2	0 9	2 0	3 6	6 0
1993	76 1	11 3	1 0	2 0	3 6	6 0
1994	74 5	12 8	1 2	2.0	3 6	5 9
1995	72.2	14 8	1 5	2 0	3 6	5 9
1996	69.1	17 8	1.9	2.0	3 5	5 7
1997	65.1	21.7	2.5	1.9	3 4	5 4

CRT – Cathode ray tube; LCD – Liquid crystal display; EL – Electroluminescent, ACP – AC plasma; DCP – DC plasma; LED – Light emitting diode.

*Inaugural address delivered in the Centre for Liquid Crystal Research, Bangalore, on 3 March 1995.