

IRPS BULLETIN

Newsletter of the International Radiation Physics Society

Vol 9 No 1

March 1995

From the Editor :

This edition of the IRPS Bulletin contains an obituary for one of its founding members, **Didier Isabelle**. Didier served for an extended period as Treasurer of the IRPS, and was very active in the production of the proceedings of the IRPS conferences. We mourn his passing. The IRPS has lost a stalwart and enthusiastic member, and many of us who knew him personally have lost a loyal and trusted friend.

Also in this edition are the regular column by our President, John Hubbell, information from the Vice-Presidents representing the IRPS world wide, and news items sent in by a number of Councillors of the IRPS. As well, I have included a selection of news items taken from journals I regularly receive. I hope that members will find this Bulletin both interesting and informative.

What is missing, however, are brief scientific articles submitted by members.

Ours is a society representing a wide range of disciplines with the common ground being the use of physics for the solution of problems. I believe that each of us stands to gain much through the free interchange of ideas concerning our particular interests. Most of the principles, and much of the mathematical theory, can be translated readily between the several fields of interests of IRPS members.

But the fact is that each particular discipline remains firmly entrenched in its own methodology, literature, and nomenclature.

It is as if we inhabit separate pill-boxes in a scientific Maginot line, and we live our lives entrenched in those pill-boxes, occasionally making contact with the outside world by written messages (this Bulletin), and repatriation from the front (our attendance at conferences).

It is important that we break free from that static line, achieve flexibility of movement, and develop a mobile front line. To do that, to achieve a maximum transfer of ideas from one discipline to the next, it is important that brief commentary on new, exciting ideas in those disciplines be made available to members so that they may be able to extend their understanding of Radiation Physics.

I urge you to take pen in hand, fire up your computers...whateverand send me short articles on topics which excite you.

Dudley Creagh

Editorial Board

Editor

D C Creagh
Department of Physics
University College
The University of New South Wales
Australian Defence Force Academy
Northcott Drive
CANBERRA ACT 2600
Tel : +61 (0)6 268 8766
Fax : +61 (0)6 247 3320
e-mail : dudley@phadfa.ph.adfa.oz.au

Editorial Committee

D A Bradley Asia Lab (Malaysia) Sdn Bhd No 6 Jalan 4/91 Taman Shamelin Perkasa 56100 Kuala Lumpur	R S Roy Bose Institute Calcutta
---	---------------------------------------

R.H. Pratt is Secretary of IRPS. Enquiries regarding the Society can be directed to Professor Pratt at : Dept of Physics & Astronomy, University of Pittsburgh, Pittsburgh PA 15260 USA. Fax : +1 301 869 7682

IRPS Council

<i>President :</i>	J H Hubbel (USA)
<i>Vice Presidents :</i>	M Berrada (Morocco) D Berenyi (Hungary) M J Cooper (UK) Z Luo (PRC China) D Nagel (USA) A Paschoa (Brazil) B Sinha (India)
<i>Secretary :</i>	R H Pratt (USA)
<i>Treasurer :</i>	A Ljubicic (Croatia)
<i>Executive Councillors:</i>	D A Bradley (Malaysia) D C Creagh (Australia) L Gerward (Denmark) A M Ghose (India) M Monnin (France) T Nakamura (Japan) S C Roy (India) F Rustichelli (Italy)

IRPS Bulletin is produced by the University College, UNSW
PP 299436/00/138

PRESIDENT'S COLUMN

John Hubbell

Some Jaipur Adventures

Many of us will be attending ISRP-7 in Jaipur, India in late February of 1997, with the exact dates yet to be determined. In February 23-26, 1995, just past, eight members of the IRPS Council (Hubbell, Pratt, Cooper, Sinha, Bradley, Ghose, Roy and Rustichelli) convened in Jaipur to "test the waters" for ISRP-7 as well as conduct some routine business. The Council Meeting deliberations are to be reported elsewhere in this Bulletin, so I am here just passing along some experiences to enhance your visit in 1997, and perhaps avoid some pitfalls. The major pitfall, encountered by David Bradley and myself, was the night-time fog in Delhi, coupled with the fact that international-flight activity in India is concentrated in the middle of the night in contrast to airport activity in Europe where it takes place more in the daylight hours. The night fog in Delhi caused my Thai Airways nonstop flight from London, scheduled to arrive in Delhi at 12.50 am, to stop in Karachi, Pakistan, at 1.30 am to wait out the Delhi weather, finally arriving in Delhi at 9.30 am, long after my 6.10 am Indian Airlines connecting flight had departed for Jaipur. Since no seats were available on later flights, at least in time to get me to the Council Meeting, I hired a car and driver for 2750 rupees (\$89) to take me by road the 258 km to Jaipur.

It was a picturesque ride from Delhi to Jaipur through the Rajasthan semi-desert terrain, and I must have seen at least 500 camels, almost all pulling either two-wheeled or four-wheeled carts. Halfway to Jaipur we stopped at a government-run restaurant with clean rest-rooms, for a bit of lunch and leg-stretching. Having left Delhi about 11.00 am, we arrived in Jaipur about 5.30 pm at the Rajputana Palace Sheraton Hotel where the Council met and where ISRP-7 will likely be convened, as the conference facilities (we inspected) are well-matched to our needs. David Bradley, coming in from Malaysia to Delhi from the opposite direction, also on a Thai Airways flight, and also booked on the same 6.10 am flight from Delhi to Jaipur, was turned back to Bangkok due to the same Delhi bad weather, and didn't arrive in Delhi until late in the evening. He also hired a car and driver, and came through the night, arriving at the Rajputana Hotel in Jaipur just in time for breakfast. Suggested Remedies : (1) if connecting in Delhi, allow a day or two in Delhi, as a cushion against missing your domestic flight; (2) enter India via another gateway city such as Bombay, which Prof P P Kane (I visited in Bombay en route home) says is less subject to night fog than Delhi.

Jaipur itself is certainly worth seeing, and is a good choice for ISRP-7, with its beauties of the yellow ("Amber") City Palace, surrounded by walls and courts of pink-coloured limestone, and the nearby Jantar Mantar array of astronomical and time-keeping sundial structures. About 4 km to the northeast of the city is the Amber Fort perched atop a hill surrounded by a ring of hills and a ridge-following wall encircling the fort-hill, the wall looking somewhat like the Great Wall of China. To ascend to the Amber Fort, at the foot of the hill there are parked a number of elephants equipped with howdahs of varying degrees of

elegance, to carry you up the hill if you prefer not to walk or to take one of the available jeeps or other vehicles. The road up the hill is not navigable by tourist bus. Due to time limitations I didn't manage to take the elephant ride up the hill. However, when my wife Jean and I attend ISRP-7 in Jaipur in 1997 we look forward to our ascent to the Amber Fort properly ensconced in a howdah atop one of the friendly lumbering elephants. I also look forward to the ISRP-7 mind-stretching scientific programme, on which considerable progress was reported at the Council Meeting, and to the usual making of new friends and renewing old friendships, in the IRPS "global radiation physics family".



DIDIER ISABELLE

It is with profound sorrow that we report the death of Didier Isabelle on February 1, 1995, five weeks after he had received a heart transplant. All IRPS members will know that he was one of our "founding Fathers" and give long service to the Society as its Treasurer, as the Programme Chairman for ISPR-4 in Sao Paulo in 1988 and for our 1994 meeting in Rabat until ill-health precluded his attendance.

My acquaintance with Didier and his wife dates from about ten years ago when he hosted a Council meeting at Orleans. I instantly liked his "no nonsense" approach to the wilder ideas flying around, his sense of humour and the authority with which he could speak on a wide range of topics in radiation physics and beyond – the latter being recognised in France by his role as Consultant Editor of the journal *La Recherche*, editor of a number of books and writer of the scenarios of a dozen scientific films. He also headed the group that devised the Nuclear Physics exhibit for the new Science City – la Villette – near Paris.

Didier studied in Paris and obtained his doctorate in 1961. He then entered the CNRS and was seconded to the National Bureau of Standards (NBS – now NIST) in Washington where he worked on the installation of a linear accelerator, returning to Orsay in 1964 to direct the nuclear physics group at its linear accelerator. The following year he became Professor at Clermont-Ferrand where he stayed until 1986. There he developed experimental programmes, one on the use of nuclear sources for mineral identification in mining and the second on radiation damage in semiconductors. After Clermont-Ferrand he became Director of CERL, the CNRS laboratory for Irradiation Studies; a post he retained until his untimely death.

He will be remembered as much for his contribution to the training of a large number of research workers, now prominent on the international and national scene, as for his individual scholarship which was considerable, he published over a hundred papers and organised many scientific meetings, not counting our own symposia.

All those who knew him will retain their own memories of Didier and an appreciation of his many qualities. Whether it was his first talk at an IRPS conference – on the transport of Radioactive Waste, in Penang in 1982 when he joked that critical mass was a factor worth considering in this context – or his timely and robust interventions in our Council meetings which led us back to reality. I can call to mind many stimulating discussions on all manner of things scientific and non-scientific, many of which were accompanied by good food and wine – and much humour.

However we remember him, we, as a Scientific Society and we as individuals, owe him a great debt. He travelled widely and worked hard to promote IRPS and to ensure that its activities were all of high quality. We should strive to do the same in his memory. The forthcoming volume of the Proceedings of ISRP-6, which he would have edited will be dedicated to his memory.

He enriched our lives and we must hope that IRPS, for which he worked hard and long, also enriched his. Our sincerest condolences go to his wife Rosine.

**REPORTS FROM VICE PRESIDENTS AND
COUNCILLORS**

***From the Vice President for Eastern Europe and
Former Soviet Union : Denes Beréncsi***

A new synchrotron source ELETTRA was put into operation in Autumn 1993 in Trieste. The measuring channels are now under intensive construction. It was reported at the 2nd Users' Meeting, Trieste, 1-2 December, 1994.

For the scientists and experts of Central Europe seems to be an easier approach of the synchrotron radiation beams of ELETTRA in the frame of the Central European Initiative political formation.

***From the Vice President for Western Europe :
Malcolm Cooper***

They say that when America sneezes Europe catches a cold, but is it true in science? A few weeks ago European Particle Physicists were delighted to learn that the CERN Large Hadron Collider Project was to go ahead, in contrast to the USA's cancellation of its own Superconducting Supercollider project. Europeans were doubtless secretly pleased that they might be able to "go slow" financially but still retain the scientific initiative. Indeed they hoped that some US money would come into the European programme to help to restore the original schedule. However in the DOE's forward look there is no mention of this possibility.

Now UK particle physicists are hearing gloomy tidings. About £2M is to be cut from annual budget of PPARC – the Particle Physics and Astronomy Research Council. Detector work associated with the Large Hadron Collider project will suffer and it looks as though the UK will be left with its feet firmly planted on the ground when the European Space Agency's gamma-ray probe achieves lift-off.

In other subject areas the UK and most other European countries are leaning towards more directed programmes. This dirigiste approach is viewed with foreboding by most researchers in fundamental physics. Certainly in the UK the pronouncements of the FORESIGHT panel are awaited with trepidation. Your correspondent is, himself, resigned to a continuing scientific life of useless research, but at the same time is delighted to note that someone has found a use for Compton scattering. Philips x-ray division in Hamburg, in a project led by Geoffrey Harding, have developed a Compton scanner capable of "one-side" inspection of components such as aircraft body panels and car cylinder head blocks. Geoffrey, who was one of our invited speakers at ISRP-4 in Sao Paulo, has been awarded the Roentgen Medal this year for his work in this area. Our warmest congratulations go to him. Meanwhile I am belatedly trying to get in on the act with a project to detect explosives such as SEMTEX in airport baggage. So far they have not

entrusted me with any real samples and so I may be around to contribute to the next issue if IRPS News!

***From the Vice President for South East Asia and
Pacific : Bikash Sinha***

An important part of CERN-INDIA Collaboration is the Photon Multiplicity Detector, designed and fabricated to measure photon multiplicity after the collision between two nuclei at CERN, PS with typically 200 GeV/nucleon. Rather recently, November '94, the detector built in India with the Calcutta Cyclotron Centre, in collaboration with Universities of Jaipur, Chandigarh, Institute of Physics at Bhubaneswar, Orissa and GS1 Darmstadt consists of 55,000 plastic scintillators, 2 mm \times 2 mm with optical fibres, inserted diagonally designed to detect photons expected to be signatures of the scenario due to the collision. There is already some preliminary evidence that the very fundamental building blocks of nature, quarks and gluons get "deconfined" in a finite volume from the neutrons and protons of the nuclei and, this is possible because of the tremendously high energy density built up. The CERN SPS experimental runs were a great success.

Centre of Advanced Technology, Indore, has successfully commissioned the microtron, the injector to the 700 MeV synchrotron, built at Indore. The synchrotron is expected to be operational very soon.

The Cyclotron Centre at Calcutta is in full swing for the new project of Superconducting Cyclotron Project, similar to the machine at Texas A & M.

A 4 MeV Linac, built in India, has had successful initial tests at the Regional Radiation Medicine Centre, of the Cyclotron Centre; the Linac is expected to be a better substitute of cobalt therapy for treatment of cancer.

The Council meeting of our society was held at the Pink City of Jaipur, February this year. Professor A M Ghosh, Council member will give a more detailed report. The Vice President, PA Asia, South East Asia wishes to report that the "exotic India" was very much there, when a marriage procession was "arranged" for the benefit of the Council members with fireworks and horses, the groom looked relatively young but bright with his prospects; the dinner, hosted by India thus had an entirely different kind of "aperitif". Welcome to Jaipur in 1997!

From Councillor David Bradley (Malaysia)

*'Second Radiation Physics Conference', Menoufia
University Faculty of Science, SHEbin El-Kom, Egypt,
20-24 November 1994*

The First Egyptian Radiation Physics Conference was held in the Qena branch campus of Assuit University during the period 15-19 November 1992. The meeting, which was jointly organised by the Egyptian Atomic Energy Authority and Assuit

University, was a considerable success and encouraged the Egyptian radiation physics community to follow up with this second meeting. Readers might also like to follow-up by taking a look at the Proceedings of the First Radiation Physics Conference published in 1994 as a Special Issue of the Elsevier journal *Radiation Physics and Chemistry*.

The Second Radiation Physics Conference was organised by the Egyptian Atomic Energy Authority and Menoufia University and was hosted by the University at its campus site in Shebin El-Kom, situated close to the Nile Delta. The region is particularly fertile and the pleasant green vistas en-route to Menoufia made the 60km journey from Cairo an enjoyable experience. One might add, especially for those who have yet to visit this part of Egypt, that the climate during the period from November through to March is highly recommended.

The structure of the meeting surrounded 14 sessions, some conducted in parallel in order to accommodate the response. Taking into account the 'no-shows' some 65 papers were finally delivered. Session titles included: Radiation Sources, Interactions of Radiation with Matter, Non-Ionising Radiations and Other Topics, Industrial Applications, Earth Sciences, Detection, Shielding, Dosimetry, Biological and Medical Applications, Radiation Protection Control and Safety and Radiation Effects. Peer reviewed papers will again appear in a Proceedings to be published as a Special Issue of the journal *Radiation Physics and Chemistry*, due out towards the end of this year or early in 1996.

Even though both the Qena and Menoufia Radiation Physics Conferences have been national meetings it ought to be mentioned that there has been good international representation at both. For the present meeting participants came from as far as Brazil, Malaysia, Taiwan, Japan, Canada, Morocco, several Eastern European countries and the Former Soviet Union. It ought also to be mentioned that there was good representation by members of IRPS, there being eight in all including three Council members.

It would be an error to attempt what would surely be an incomplete list of all those involved in the organisation of this meeting but the primary role played by Professor M A Gomaa of the AEC in ensuring the success of the event should not go unmentioned. Professor Gomaa and his colleagues at the University of Menoufia and at the AEC are to be congratulated for their fine efforts.

From Councillor Leif Gerward (Denmark)

Roentgen Centennial 1895-1995

The discovery of X-rays by W. C. Roentgen in 1895 had a resounding impact on medicine and science (see article by Lindegaard-Andersen and Gerward in IRPS Bulletin Vol. 8, No. 3/4, p. 13). Many scientific societies are going to arrange meetings in 1995/96

with a strong historical element in the programme in addition to a celebration of current science and a forward look to the next millenium.

The Roentgen Centenary Congress in Birmingham, UK, 12-16 June, will be one of the premier meetings to be held in Europe in 1995, organised by all the major organisations concerned with radiological science in Britain. A centrepiece of the technical exhibition will be a dedicated historical display entitled *The Invisible Light: 100 Years of Medical Radiology*, which will illustrate developments in the radiological sciences from 1895 to the present day.

An American counterpart to the British meeting is the *X-Ray Centennial* in Boston, MA, USA, 23-27 July 1995. The German radiation research community and the International Association for Radiation Research are organising the *10th International Congress of Radiation Research* in Wuerzburg, Germany, 27 August - 1 September. The Polish Society of Medical Physics has dedicated its *10th Congress* to the 100th anniversary of the discovery of the X-rays. The meeting will take place in Cracow, Poland, 15-18 September. The important anniversary also has given occasion to call for a *Roentgen Centenary Congress* in Wuerzburg, Germany, the birthplace of the X-rays, to bring together medical physicists from all over the world. The congress, on 20-23 September, will be organised by the German and the International Societies for Medical Physics, with the International Union of Physical and Engineering Sciences in Medicine as a sponsor.

The *Annual Meeting of the American Crystallographic Association* in Montréal, Canada, 23-28 July 1995, will contain a Plenary Anniversary Session, *One Hundred Years of X-rays*. The first talk in this session is an authoritative review of X-ray generation over the past century, most of the talk dealing with the state of the art of X-ray generation in 1995. The second talk will describe ion-edge angiography, one of the forefront medical applications of X-rays.

Roentgenstrahlung from the Universe is the title of an international conference on X-ray astronomy and astrophysics in Wuerzburg, Germany, 25-29 September 1995. The meeting will address the whole field of X-ray astronomy and X-ray missions. At the same time the conference will mark the 5th anniversary of the launch of ROSAT, an X-ray satellite named after Roentgen. This satellite has produced a wealth of new scientific data for a wide scientific community.

On 23-28 October 1995, the Institute of Physics at the University of Wuerzburg, Germany, is organising a congress, entitled *Roentgen Centennial. International Congress on the 100th Anniversary of the Discovery of X-Rays in Wuerzburg*. The meeting will cover most X-ray related topics in basic physics and applications in various fields. It will bring together leading experts from all over the world to celebrate an important event in the history of science and to discuss the present

status and future aspects of X-rays and their applications.

The *International Schools and Conference on X-Ray Analytical Methods* to be held in Sydney, Australia, 18-25 January 1996, is another event commemorating 100 years of X-ray use by mankind. The scientific programme will cover various applications of X-rays including analytical, structural, medical and industrial applications. The exhibition on recent advances in technology will be complemented by a symposium on the developments of X-rays over the last 100 years together with a display of memorabilia.

Finally, it should be mentioned that the University of Wuerzburg, Germany, is running an interesting historical exhibition, *100 Years of X-Rays*, celebrating Wilhelm Conrad Roentgen and illustrating the developments in X-ray science and technology from 1895 to the present day. The exhibition is open daily from 14 February to 19 November 1995.

Details about the meetings mentioned above are given in the Calendar of this Bulletin. IRPS is making an effort to be represented at most of these meetings by a poster, describing the primary objective and the activities of our Society. The poster should be useful for presentation at other conferences as well. IRPS members, who are interested in copies of the poster for a missionary approach, are welcome to contact Leif Gerward, Physics Dept., Bldg. 307, Technical University of Denmark, DK-2800 Lyngby, Denmark (e-mail: gerward@fysik.dtu.dk).

From Councillor A M Ghose (India)

A meeting of the Executive Council of IRPS was held in Jaipur, the Capital of the historical Rajasthan State in India on 24 and 25 February, 1995. Jaipur is the venue of the Seventh International Symposium on Radiation Physics – ISRP-7, which is scheduled to be held in February 1997. The symposium will be hosted jointly by IRPS and the University of Rajasthan and naturally a substantial part of the deliberations of the Executive Council was devoted to the organisation of ISRP-7. Dr Bikash Sinha, the Chairman and Professor A M Ghose, the Co-Chairman of the Organising Committee, outlined various measures which have to be implemented during the intervening period to make ISRP-7 a success. Prof B K Sharma of the University of Rajasthan conveyed the offer for full cooperation by the Vice-Chancellor of the University of Rajasthan, who was unable to attend the meeting. The Council was informed that the University will celebrate its Silver Jubilee Year in 1997 and a new auditorium will be ready before ISRP-7.

Drs D Bradley and F Rustichelli, Co-Chairman of the International Programme Committee, suggested the following topics to be discussed during the Symposium:

1. Fundamental Processes in Radiation Physics
2. Applications of Radiation in Fundamental Physics Research
3. Radiation Sources and Detectors
4. Radiation in Technology
5. Biophysics Mechanisms, Medical Physics and Radiological Health
6. Radiation in Astrophysics, Cosmology and Space Sciences
7. Radiation in Archeometry

The Seventeenth Century city of Jaipur is an important tourist centre. The walled inner city has pink palaces made of red stones while the other are of pink colour – hence the name Pink City. Jaipur has a large observatory suitable for visual astronomy which was built during the Eighteenth Century. In addition to the University, Jaipur has other institutions like medical college for women. In the vicinity of Jaipur, there are several castles, one of which, the Amber Fort, was seat of royalty before Jaipur.

From Councillor Takashi Nakamura (Japan)

Recently, Professor Takashi Nakamura, Tohoku University, organized "Radiation Engineering Section" for the Atomic Energy Society of Japan. More than 150 members belong to the section, a brief description of which is given below.

- The section assists the research co-operation and information exchange on the radiation engineering among the members, and contributes to develop the fields.
- Regular and student members in the Atomic Energy Society of Japan are able to become a member of the section.
- The section intends to hold a general meeting once a year to discuss, and obtain approval for, tasks, budget, management and the other important matters.
- The section has the following functions:
 - (i) It provides technical information in the form of a News Letter
 - (ii) It holds regular research meetings, seminars and summer schools
 - (iii) Research co-operation occurs with other societies and associations inside and outside Japan. As necessary, the section will assist in the organisation of international symposia or workshops somewhere else in the world.

(iv) Other tasks can be performed where required.

• Our particular fields of concern are

(i) Radiation Physics and Measurements

(ii) Radiation Interaction with Matter

(iii) Radiation Application to Engineering

(iv) Radiation Shielding

(v) Radiation Protection and Dose Evaluation.

If you have an organization or a group working on radiation engineering in your country, we would like to make contact with it. Initially, **we hope to contact Asian researchers, especially in the field of Radiation Shielding and Protection.**

Please let us know if there is a person who can act as contact with us.

We appreciate any help you might be able to give us. Please contact the following person with, or for, information :

Kohtaro Ueki
Chief of General Affairs
Radiation Engineering Section
Atomic Energy Society of Japan
Ship Research Institute
6-38-1 Shinkawa, Mitaka
TOKYO 181 JAPAN

PAPERS

LNLS Synchrotron, Brazil

*C E T Gonzalves da Silva, A R D Rodrigues
and A F Craievich*

(Source : IUCr Newsletter (1994) 4, 14)

The synchrotron radiation source which is being constructed at LNLS (Laboratório Nacional de Luz Síncrotron) is composed of a 100 MeV LINAC injector and a 1.15 GeV electron storage ring. Two beamlines and workstations are completed and five are under construction. They are associated with several experimental techniques, including VUV and X-ray spectroscopies and X-ray diffraction and scattering.

The LNLS storage ring, to be commissioned at the beginning of 1996, is a sixfold symmetric double-bend Chasman-Green achromat lattice. Four of the six dispersion-free straight sections are available for insertion devices, each with a useful length of 3 meters. At the moment, the construction of most of the components of the injector and storage ring (excepting the wigglers) has been completed. Parallel to the construction of the synchrotron source, the LNLS is working on the design and construction of the beamlines associated with different experimental techniques and applications.

- *XAFS (XANES and EXAFS) (X-ray Absorption Near-Edge Structure and Extended X-ray Absorption Fine Structure).* Applications: Local atomic structure of disordered materials (glass, multilayers, composites, catalyzers, etc), electronic and magnetic structure of solids.
- *TGM (Toroidal Grating Monochromator).* Applications: Surface physics, surface chemistry, molecular spectroscopy, electronic structure of condensed matter, mass spectroscopy.
- *SGM (Spherical Grating Monochromator).* Applications: High-resolution soft X-ray spectroscopies, electronic and magnetic properties of materials.
- *Soft X-ray Spectroscopy.* Applications: Soft X-ray spectroscopy of transition metals and rare earth systems (thin films, multilayers, alloys and compounds), core level spectroscopy.
- *X-ray Diffraction.* Applications: Multiple-axis goniometry: rocking curves, standing waves, back diffraction, topography, multiple diffraction, grazing incidence. Q and $2Q$ goniometry: Debye-Scherrer powder diffraction, texture, structural characterization of epitaxial layers and nanostructures. Single- and multiple-crystal optical studies and devices. Metal and alloy surface studies: high temperature corrosion and recrystallization.
- *SAXS (Small-Angle X-ray Scattering).* Applications: Heterogeneous materials, characterization of fractal structures, microporous materials, microphase separation, composite glass-

semiconductor nanocrystals, gels, proteins in solution.

- *Protein Crystallography*. Applications: High-resolution structure determination of crystallized proteins and other macromolecules of biological importance.

The first two workstations described above were constructed at LNLS and are already in operation at the Center for Advanced Microstructures and Devices (CAMD, Louisiana State U.), four are under construction at LNLS, most of them in collaboration with external users, and the last is in the design stage. Additional technical information about the different workstations under construction at LNLS or now in operation at CAMD may be requested from the authors at Laboratório Nacional de Luz Síncrotron/CNPq, Inst. de Física, CP 6192, 13081-970 Campinas, SP, Brazil.

Germans announce plans for a new research reactor

Erich Steichele
FRM, Technical University of Munich, Munich,
Germany

(Source : *Neutron News* (1995) 6, 27)

The new research reactor FRM-II (Forschungsreaktor München-II) is being planned to replace the existing reactor FRM in Garching near Munich. It is conceived to be the German supraregional intense neutron source for the beginning of the next century. It will be built by the Technical University of Munich and the Siemens Company. The engineering task to be solved was to find the optimum compromise for conflicting demands such as high neutron flux for cold neutrons, minimization of nuclear inventory and waste, highest passive security and moderate investment and operating costs. The technical concept of the reactor essentially relies on a very compact reactor core using highly enriched uranium (HEU) to achieve a better flux-to-power ratio than realized so far – about 8×10^{14} n/cm² unperturbed thermal flux outside of the core with a power of 20 MW. The reactor is cooled by light water inside the fuel element and moderated by heavy water outside the fuel element. It will be equipped with a cold source, a hot source, irradiation plants, ten horizontal and two inclined beam-holes, neutron guides and a neutron guide hall. More than 20 experiments and instruments can be supplied with neutrons of a broad energy range.

With the exceptionally strong support of the project by the state of Bavaria, the contract for construction was signed by the Technical University of Munich and Siemens on September 6, 1994. The costs of designing and constructing the facility, including scientific instruments, are estimated at DM 680 million (in 1994 money). The Federal Government will grant DM 160 million from the Research and Technology budget (BMFT). The other part will be provided by the Federal Education and Science budget and the State of Bavaria. Operation expenses are estimated at about DM 200 million for the first ten years, of which DM 80 million will be covered by the BMFT and the remainder by the State of Bavaria.

The formal nuclear licensing procedure was started in 1993 and is now underway. The safety report was made public by the end of 1993.

Assuming that no major safety problems will be found in the design and planning of the reactor, a first notice of approval is expected in 1995. Immediately after, the construction of the reactor building can start.

Australia-Japan Symposium on Powder Diffraction

Hiroo Hashizume

(Source : *Society of Crystallographers in Aust Inc*
(1995) 27, 4)

The first Australia-Japan symposium on powder diffraction, *Impact of Powder Diffraction on Advanced Materials Research*, held during the Crystallographic Society of Japan 1994 annual meeting at Osaka University (24-26 Nov 94) was a great success. More than sixty participants attended, and participated actively in discussions, demonstrating the interest of Japanese crystallographers in the Australian National Beamline Facility at the Photon Factory. After a short introductory talk by Professor Hashizume, six presentations were presented at the symposium:

- The Multi-purpose Diffractometer on the Australian National Beamline at the Photon Factory. Dudley Creagh (Univ. of New South Wales).
- Initial Experiments with BIGDIFF on Beamline 20B at the Photon Factory and Prospects for Use in Powder Diffraction Application Studies. Brian O'Connor, A van Riessen, G Burton, J Carter (Curtin Univ.), Richard G Barrett and D Cookson (ANBF, Photon Factory).
- Analysis of Powder Diffraction Collected on the Australian Beamline at the Photon Factory. D Cookson, G Foran, Richard Garrett (ANBF, Photon Factory), Brendan Kennedy (Univ. of Sydney) and Terry Sabine (ANSTO).
- Current Powder Diffraction Research Using Synchrotron Radiation in Japan. H Toraya (Nagoya Inst. Tech).
- Neutron Powder Diffraction in Australian Materials Research. Chris Howard, Brett Hunter and Shane Kennedy (ANSTO).
- Application of TOF Neutron Powder Diffraction to High-Tc Super-conductors. F Izumi (Nat. Inst. for Res. in Inorg. Matter).

David Cookson, Dudley Creagh and Shane Kennedy impressed the audience who believe that the high resolution, clean signal and speed of BIGDIFF is not obtainable on any other beamline instrument. Dudley announced that the powder diffractometer using imaging plates would be considered to be operational in 1995 and open for general proposals. He also described how the new technique of Diffraction Anomalous Fine Structure (DAFS) can be employed using BIGDIFF. Chris Howard explained how neutrons diffraction can be used to complement

X-ray diffraction in his masterful talk. Dudley Creagh gave a speech, which was well received, at the conference party. He described the past collaborations which enabled the creation and operation of the ANBF at the Photon Factory. The Australian presence in the Japanese crystallographic community is now well recognized. What needs to be pursued in future is the human interaction and a strengthening of scientific collaborations.

CERN embarks on the LHC

(Source : Physics World, January 1995)

The collider will be built in two stages in the same tunnel as CERN's Large Electron Positron collider. LEP is housed in a 27 km-circumference tunnel that straddles the France-Switzerland border. The first stage will be a particle collider with an energy of 10 TeV which would be ready to start experiments in 2004. A full research programme on the top quark, charge-parity (CP) violation and heavy ion physics will then be possible, as well as a preliminary exploration of the energies at which the elusive Higgs boson is expected to be accessible.

In 2008 extra magnets will be added to reach a centre-of-mass energy of 14 TeV and allow a comprehensive exploration of Higgs-boson physics. According to the particle physicists' Standard Model, the Higgs plays a central role in giving at least some particles their mass.

CERN's council also determined that there should be a comprehensive review of the progress before the end of 1997. Several non-member states – the US, Japan, Canada, the Russian Federation, India and Israel – have expressed interest in participating in LHC programmes. If, by 1997, it is clear that sufficient financial commitments from non-member states are forthcoming, it would be possible to switch to the immediate construction of a 14 TeV accelerator to be ready, perhaps, by 2005.

CERN director-general Chris Llewellyn Smith said: "Council's design has assured a great future for world particle physics and for CERN".

Llewellyn Smith anticipates hard bargaining with the US and Japan over financial contributions in return for roles in the management of the project. "I'm keen to get real partnerships. For instance, there's great interest amongst accelerator physicists in centres like Fermilab, and although we are very strong in that area, there is no doubt that they would help us do better". The US and Japan may become formally linked to CERN as associate members, giving them greater influence on CERN's planning. Other physicists are speculating that both countries will also bring into the negotiations the site of the Next Linear Collider, the mega-machine expected to follow the LHC.

John O'Fallon, representing the US Department of Energy, said "The US high-energy physics community has a great interest in the LHC and we invite the director-general and his negotiating team to come to Washington to work on the details of US participation in the LHC". In Washington, Martha Krebs, head of research at the DOE, announced that an

interagency working group has been established to develop the US position.

Hiroshi Takahashi, from the Japanese mission in Geneva, also welcomed the decision to go ahead with the LHC, and stated the intent of the Japanese "to start examination of the possibilities of Japanese cooperation with CERN on the LHC".

A key element of the LHC will be its superconducting bending magnets, which are 14 metres long and expected to sustain a field of over 8 Tesla at 1.8 K. Progress in testing has been excellent, according to CERN sources, though the requirements in producing 1000 of them will place strong demands on Europe's industry.

Other challenges ahead include the development of the detectors and the computing and processing required for data capture and analysis – all major tasks given the unprecedented quantities of collision products.

Proposals for "CMS" and "ATLAS", the LHC's two main detectors, are to be reviewed and costed over the next few weeks. Their target costs were set at SwF 300m each – the detectors for heavy-ion and B-meson physics are expected to cost less than a quarter of this figure.

Detector costs will be borne by the domestic budgets of member states, plus contributions from non-member states that remain to be negotiated. The new time-table delays the start-up of LHC by a year, easing the pressure on budgets; it also gives the collaborations more time to install the experiments when the LEP accelerator closes down at the turn of the century.

Following negotiations, CERN's member states have also agreed that:

- Germany's contribution to the budget will be held at 22.5% (its post-unification "discount") until 31 December 1998;
- as "host states", France and Switzerland will contribute SwF 65m and SwF 60m respectively, and also index their subscriptions by the full rate of inflation after 1998, yielding an estimated total host-state contribution of SwF 200m;
- future budget decisions will require the support of the majority of member states. These member states will also have to collectively contribute 70% of the annual budget.

ILL is well again

(Source : Physics World, February, 1995, p6)

The Institut Laue-Langevin neutron source in Grenoble, France, finally started up again last month – almost four years after a fault in the nuclear reactor that produces the neutrons closed the source. User experiments are expected to start early next month. The reactor had been ready to re-start in July but it took six months to collect the necessary signatures –

those of the prime minister, the industry minister and the environment minister – for it to resume operation.

More than 1400 physicists, chemists, biologists and materials scientists are expected at the ILL, the world's most powerful neutron source, this year. The demand for beam-time during the first half of 1995 outstripped the time available by a factor of 2.3. However, when they return to Grenoble the researchers will find fewer staff and fewer instruments – 25 rather than 30 – than there were before the shut-down. The number of experimental cycles has also been reduced from six to five. The reductions are due to the UK's insistence on cutting the lab's budget when the reactor repair was being discussed. At the time, the UK, France and Germany were equal partners in the lab – now the UK pays slightly less.

News Item

The January 1995 issue of *Health Physics* reports that on 12 September 1994 the Board of Governors of the IAEA approved the International Basic Safety Standard for protection against ionising radiation and the safety of radiation sources (abbreviated to BSS). The contents of this long awaited document, expected to set safety standards for many years to come, are reviewed in the 'News and Notices' section (p128) of *Health Physics*. The BSS is jointly sponsored by the IAEA, FAO, ILO, NEA(OECD), PAHO and WHO.

CALENDAR

1995

March

- 27–30 *IAU Colloquium on Astrophysics in Extreme Ultraviolet*, Berkeley, CA, USA; S Lilly, Centre for EUV Astrophysics, 2150 Kitredge Street, Berkeley, CA 94720, USA
- 27–30 *Institute of Physics Annual Congress 1995*, Telford, UK; Meetings and Conference Department, Institute of Physics, 47 Belgrave Square, London SW18QX, UK

April

- 3–6 *5th European Conf. on Atomic and Molecular Physics* Edinburgh, UK; N Mason, Department of Physics and Astronomy, University College, Gower Street, London WC1E 6BT, UK
- 17–21 *MRS Spring Meeting*, San Francisco, CA, USA; Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237, USA
- 18–21 *19th Mtg. of Society of Crystallographers in Australia*, Ballarat, Australia; I Grey/L Cranswick, CSIRO Div of Mineral Products, PO Box 124, Port Melbourne, Vic 3207, Australia
- 18–21 *Spring Meeting of the American Physical Society*, Washington, DC, USA; American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, USA
- 24–28 *12th Int. Workshop on Laser Interaction and related plasma phenomena*, Osaka, Japan; S Nakai, ILE, Osaka University, 2-6 Yamadaoka, Suita Osaka 565, Japan
- 25–27 *Towards the Source of Gamma-ray Bursts (ESLAB Symposium)*, Noordwijk, The Netherlands; E Cheroux, ESTEC, Postbus 299, NL-2200, AG Noordwijk, The Netherlands

May

- 1–5 *Conf. on Particle Accelerators*, Dallas, TX, USA; O Schriber, LANL, PO Box 1663, MS H850, Los Alamos, NM 87545, USA
- 8–10 *NSLS Users' Meeting*, Upton, NY, USA; Linda Feierabend, NSLS, User Administration Office, Bldg. 725B, Upton, NY 11973-5000, USA
- 21–26 *Conf. on Lasers and Electro-optics (CLEO)/Quantum Electronics and Laser Science (QELS)*, Baltimore, Md, USA: (OSA)
- 28 May–1 June *Seventh Asian & Oceanic Congress of Radiology (AOCR'95)*, Kuala Lumpur; Congress Secretariat (7th AOCR), C/- Dept of Radiology, University Hospital, 59100 Kuala Lumpur, Telephone and Fax No. 603 7581973.

June

- 5–7 *Conf. on Plasma Science*, Madison, WI, USA; J Scharer, Department of Electrical and Computer Engineering, University of Wisconsin, Madison, WI 53706, USA
- 7–10 *Int. Symp. on Exotic Atoms and Nuclei*, Hakone, Japan; S Hayano, Physics Department, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan
- 11–16 *186th Mtg. of American Astronomical Society*, Pittsburgh, PA, USA; (ASS)
- 11–16 *12th Int. Conf. on Laser Spectroscopy (IUPAP)*, Capri, Napoli; P DeNatale, Department of Physics, University of Florence, Largo E Fermi 2, 50125 Firenze, Italy
- 12–16 *Int. Conf. on Weak and Electromagnetic Interactions in Nuclei (WEIN 95)*, Osaka, Japan; H Eirjri, Department of Physics, Osaka University, Toyonaka, Osaka 560, Japan
- 12–16 *Roentgen Centenary Congress: 100 years of x-rays*, Birmingham, UK; British Institute of Radiology, Institute House, 36 Portland Place, London W1N 4AT, UK
- 12 Jun –28 July *Summer School in High Energy Physics and Cosmology*, Trieste, Italy; (ICTP)
- 19–23 *Int. Conf. on Exotic Nuclei and Atomic Masses (IUPAP)*, Aries, France; D Guillemand-Mueller, Institute de Physique Nucleaire, F-91406 Orsay Cedex, France
- 25–30 *Solar Wind 8*, Dana Point, CA, USA; D J McComas, Solar Wind 8, Mail Stop D466, Los Alamos National Laboratory, Los Alamos NM 87545, USA
- 26–30 *Fourth International Conference on Surface X-Ray and Neutron Scattering*, Argonne, Illinois, USA; 4SXNS Secretariat, Building 360, Room F-108, Argonne National Laboratory, Argonne, Illinois 60439, USA

July

- 2–7 *22nd European Conf. on Controlled Fusion and Plasma Physics*, Bournemouth, UK; G Blankenback, JET, Abingdon OX14 3EA, UK
- 10–14 *6th Int. Symp. on Meson-Nucleon Physics and Structure of the Nucleon*, Blaubeuren, Germany; R Bilger, Physikalisches Inst, Univ Tübingen, D-72076 Tübingen, Germany
- 17–28 *School on Non-accelerator Particle Astrophysics*, Trieste, Italy; (ICTP)

../July continued

CALENDAR

1995

July (C'td)

- 23–27 *X-ray Centennial*, Boston, MA, USA; R Burke, Health Physics Society, 8000 Westpark Drive, Suite 130, McLean, VA 22102, USA
- 23–28 *American Crystallographic Association (ACA) Annual Meeting*, Montréal, Canada; Yvon LePage, e-mail: yvon@iecem.s.lan.nrc.ca
- 26 July –1 Aug *19th Int. Conf. on Physics of Electronic and Atomic Collisions (IUPAP)*, Whistler, BC, Canada; Int. Conf. Services, 604-850 West Hastings St, Vancouver, BC, Canada V6C 1E1
- 27–29 *Workshop on the Search for New Elementary Particles*, Trieste, Italy; (ICTP)
- 31 July –4 Aug *22nd Int. Conf. on Phenomena in Ionized Gases*, Hoboken, NJ, USA; W E Carr, Department of Physics, Stevens Institute of Technology, Hoboken, NJ 07030, USA

August

- 21–26 *8th Int. Conf. on Nuclear Physics (IUPAP)*, Beijing, China; Sun Zuxun, China Inst. of Atomic Energy, POB 275, Beijing 102413, China
- 27 Aug–9 Sept *11th Int. Conf. on Vacuum Ultraviolet Radiation Physics (IUPAP)*, Tokyo, Japan; T Ishii, Inst. for Solid State Physics, University of Tokyo, Tokyo 106, Japan
- 27 Aug–1 Sept *10th International Congress of Radiation Research*, Wuerzburg, Germany; GSF Research Centre, Congress Service, Neuherberg, Postfach 1129, D-85758 Oberschleissheim, Germany
- 28 Aug–3 Sept *New Trends in Quantum Field Theory (IUPAP)*, Sofia, Bulgaria; R Kerner, LGCR, Univesite Paris VI, 4 Pl Jussieu, Paris 75005, France
- 28 Aug–8 Sept *24th Int. Comm. on Cosmic Rays (IUPAP)*, Rome, Italy; N Iucci, Dipt di Fisica Generale, Univrsita degli studi "La Sapienza", P le Aldo Moro 2, 00185 Roma, Italy

September

- 10–15 *Optical Society of America 95 Ann.Mtg.*, Portland, OR, USA; (OSA)
- 11–15 *Int. Conf. on the Physics of Strongly Coupled Plasmas*, Binz, Ruegen, Germany; W Kraeft, Fachbereich Physik, Universitat Greifswald, Domstrasse 10a, D-17489 Greifswald, Germany
- 11–15 *Gas Discharges and Their Applications*, Tokyo, Japan; GD95, Department of Electrical and Electronic Engineering, Musashi Institute of Technology, 1-28-1 Tamazutsumi, Setagaya-ku, Tokyo 158, Japan

September (C'td)

- 15–18 *10th Congress of Polish Society of Medical Physics*, Cracow, Poland; M Radwanska, e-mail: radwanska@novell.ftj.agh.edu.pl
- 20–23 *Roentgen Centenary Congress*, Wuerzburg, Germany; Kongress-Partner, Eberhardt-Gastell & Neumann GmbH, Bottenhorner Weg 16, D-60489 Frankfurt, Germany
- 25–29 *Roentgenstrahlung from the Universe*, Wuerzburg, Germany; X-ray Conference Secretariat, Max-Planck-Institut f. Extraterrestrische Physik, Postfach 1603, D-85740 Garching, Germany
- 12–21 *Fourth Oxford Summer School in Neutron Scattering*, Oxford, UK; Prof B T M Willis, Chemical Crystallography Laboratory, 9 Parks Road, Oxford OX1 3PD, UK
- 23–28 *Quantum Optics*, Davos Platz, Switzerland; (ESF)

October

- 8–13 *14th Int. Conf. on Cyclotrons and their Applications (IUPAP)*, Faure, South Africa; M Herbert, National Accelerator Centre, PO Box 72, Faure 7131, South Africa
- 23–28 *Roentgen Centennial*, Wuerzburg, Germany; E Umbach, Physics Dept, Univ. of Wuerzburg, Am Hubland, D-97074 Wuerzburg, Germany
- 30 Oct –1 Dec *School on Synchrotron Radiation in Science and Technology*, Trieste, Italy; (ICTP)

November

- 20–24 *Int. Conf. on Ultrafast Processes in Spectroscopy*, Trieste, Italy; (ICTP)

1996

January

- 18–25 *International Schools and Conference on X-Ray Analytical Methods (AXAA)*, Sydney, Australia; N Stephenson, AXAA '96 Secretariat, GPO Box 128 Sydney, NSW 2001 Australia

March

- 15–20 *Sixth Conference of Nuclear Sciences and Applications*, Cairo, Egypt; Prof Dr A I Helal, Atomic Energy Authority (ESNSAS) 101 Kasr El-Eini Street, Cairo, Egypt, Fax No. 00202 3543451

July

- 21–25 *X International Conference on Small-Angle Scattering*, Campinas, Brazil; Prof. Aldo Craievich, LNLS, Cx Postal 6192, 13081-970 Campinas, SP, Brazil

INTERNATIONAL RADIATION PHYSICS SOCIETY

The primary objective of the International Radiation Physics Society (IRPS) is to promote the global exchange and integration of scientific information pertaining to the interdisciplinary subject of radiation physics, including the promotion of (i) theoretical and experimental research in radiation physics, (ii) investigation of physical aspects of interactions of radiations with living systems, (iii) education in radiation physics and (iv) utilization of radiations for peaceful purposes.

The Constitution of the IRPS defines Radiation Physics as "the branch of science which deals with the physical aspects of interactions of ionizing radiations (both electromagnetic and particulate) with matter". It thus differs in emphasis both from atomic and nuclear physics and from radiation biology and medicine, instead focussing on the radiations.

The International Radiation Physics Society (IRPS) was founded in 1985 in Ferrara, Italy at the 3rd International Symposium on Radiation Physics (ISRP-3, 1985) following Symposia in Calcutta, India (ISRP-1, 1974) and in Penang, Malaysia (ISRP-2, 1982). Further Symposia have been held in Sao Paulo, Brazil (SRP-4, 1988), Dubrovnik, Croatia (ISRP-5, 1991) and in Rabat, Morocco (ISRP-6, 1994). ISRP-7 (1997) will be in Jaipur, India. The IRPS also sponsors regional Radiation Physics Symposia.

A newsletter, **IRPS Bulletin**, is published quarterly and sent to all IRPS members.

The IRPS Secretariat is (Prof. R H Pratt, IRPS Sec), Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260 USA. Telephone +1 412 624-9052, Fax +1 412 624-9163.

The IRPS welcomes your participation in this "global radiation physics family".

Membership Registration Form

1. Name: _____

(First)
(Initial)
(Last)
2. Date and Place of Birth: _____
3. Business Address: _____

 Telephone: _____ Telex: _____ Fax: _____
4. Current Title or Academic Rank (please also indicate if Miss, Mrs or Ms)

5. Field(s) of interest in Radiation Physics (please attach a list of your publications, if any, in the field)

6. Please list any national or international organisation(s) involved in one or more branches of Radiation Physics of which you are a member, also your status (e.g., student member, member, fellow, emeritus):

7. The IRPS has no entrance fee requirement, only annual membership dues (or 3-year dues payment option, with savings):

Membership Dues (stated in US dollars; circle equivalent-amount sent):

<i>Full Voting Member :</i>	<u>1 year</u>	<u>3 years</u>	<i>Student Member:</i>	<u>1 year</u>	<u>3 years</u>
Developed country	\$15	\$40	Developed country	\$6	\$15
Developing country	\$5	\$12.50	Developing country	\$2	\$5

Acceptable modes of IRPS membership dues payment, to start or to continue IRPS membership, are listed below. Please check payment-mode used, enter amount (in currency-type used), and follow instructions in item (8) below. (For currency conversion, please consult newspaper financial pages at the time of payment). All checks should be made payable to **International Radiation Physics Society**.

Continued overleaf

[] (in US dollars, drawn on a US bank): Send to Prof. Richard H. Pratt, IRPS Secretary, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260 USA.

Amount paid (in US dollars): _____

[] (in Swiss francs): Send to IRPS Account No C7-111.441.0, Swiss Bank Corporation N, CH-1211 Geneve 11, Switzerland. If you prefer, you may instead send a Eurocheck in Swiss francs to: Prof Ante Ljubicic (IRPS Treasurer), Institute Rudjer Boskovic, PO Box 1016, 4100 Zagreb, Croatia.

Amount paid (in Swiss francs): _____

[] (in UK pounds): Send to Prof Malcolm J Cooper, Physics Department, University of Warwick, Coventry, CV4 7AL, UK. Bank transfer details: Account number 60527440. Bank and Branch code: Barclays, code 20-23-55. Eurochecks in UK pounds, sent to Prof Cooper, also acceptable.

Amount paid (in UK pounds): _____

[] (in Indian rupees): Send to Prof S C Roy, Department of Physics, Bose Institute, 93/1 Acharya Prafulla Chandra Road, Calcutta 700 009, India. Bank transfer details: Account number SB A/C No. 9922, Canara Bank, Gariahat Branch, Calcutta.

Amount paid (in Indian rupees): _____

[] (in Hungarian forints): Send to Prof Denes Berenyi, Dir., Institute of Nuclear Research of the Hungarian Academy of Sciences, Bem ter 18/C, PF 51, H-4001, Debrecen, Hungary.

Amount paid (in Hungarian forints): _____

8. Send this Membership Registration form **and** a copy of your bank transfer receipt (or copy of your check) to the Membership Coordinator :

Prof S C Roy, Dept. of Physics, Bose Institute, 93/1 Acharya Prafulla Chandra Road, Calcutta 700 009, India
Telex: 021-2646 Bi In *Fax:* +91-33-34-3886 or +91-33-350-6790 *e-mail:* scroy@boseinst.ernet.in

9. _____
(Signature)

(Date)

PP 209436/00/38

AIR MAIL