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EDITORIAL

This issue of the IRPS Bulletin contains information about Fellowship grade in the International Radiation Physics Society.

It also contains a contribution about the new Shanghai Synchrotron Radiation Facility.

Suprakash Roy has also contributed some reflections on the recent tsunami. Let me join him in sending my condolences to those affected by that event.

Paul Bergstrom

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PRESIDENT'S REPORT

I would like to devote and dedicate this column to the late Ananda Ghose, one of the primary founders of the International Radiation Physics Society, who died in Calcutta May 23, 2004 (his obituary is in the August 2004 issue of the Bulletin).

Certainly my involvement in radiation physics as a discipline, and my understanding of the concept of promoting radiation physics as a focus within physics, resulted from meeting Anu Ghose, and being inspired and encouraged by his enthusiasm. I believe many of us in the Society share a common respect for his achievements, both in science and in promoting radiation physics.

I first met Anu Ghose in Calcutta on my first trip to India, in February 1974, sent by the US National Science Foundation to explore opportunities for cooperative research with several Indian universities and institutes. I chose to visit Anu because I was aware of his experimental work on photon-atom scattering. My visit to the Bose Institute in Calcutta turned out to be very brief, as on arriving in India I found there had been a labor dispute of the Indian Airlines, and all internal flights had been cancelled. A new schedule was arranged for me, but it only allowed me one day in Calcutta. Nonetheless, Ghose and I were able to discuss possibilities for cooperative research in Rayleigh and Compton scattering, combining the experimental program in Calcutta and the theoretical program in Pittsburgh. I also at that time first met Ghose's student Suprakash Roy, one of his two students who have subsequently become very active in the IRPS.

Our idea to cooperate did eventually succeed, but only some years later, as initially the climate for cooperative research programs was not favorable. It is an illustration of the need to persevere, to not forget objectives even as one shifts directions when one direction is blocked. The next step came in 1979, when Suprakash Roy came to Pittsburgh to work with us, and he participated with Lynn Kissel in the first work done with our new code for Rayleigh scattering. At that time Professor Ghose moved to the Universiti Sains Malaysia in Penang, where he proceeded to organize the second ISRP in 1982.

I saw Anu Ghose again in Penang in 1982, and there was discussion of the idea of forming IRPS, and of the formation of a pro-tem committee. We also discussed possible cooperative activities between the groups in Pittsburgh and in Calcutta and Penang, and further visits I would make to Malaysia. It was also at that time that I met David Bradley, Anu Ghose's last student, who became active in IRPS and has now succeeded me as Secretary of the Society.

By 1985 we had achieved an NSF-sponsored international cooperation with the University in Malaysia, and Anu Ghose visited us in Pittsburgh, the first of several such visits. I have a handwritten vita which he prepared at that time, describing his activities in (a) interactions of gamma rays with matter, (b) development of photon detectors with special properties, (c) cold neutron spectroscopy to determine phonon dispersion relations, (d) interaction of 14MeV neutrons with matter and development of special fast neutron detectors, (e) self-diffusion in liquid metals, (f) a new electrokinetic effect in electrolytes under high transverse electric fields, and (g) applications of radiation physics. Later, in 1988, we also achieved an Indo-US cooperative program with Suprakash Roy in Calcutta. Anu Ghose also organized further symposia in Calcutta, after his return there.

Meantime discussions continued toward the formation of IRPS. On behalf of the pro-tem committee, and with continuing advice from Anu Ghose, John Hubbell, David Bradley and I met in Washington in 1985 to assemble a proposed draft constitution, for consideration at ISRP-3 in Ferrara in September, as part of an agenda for the Pro-tem Committee which Anu Ghose and I prepared. Ghose also wrote to John Hubbell at that time saying that "I feel I have done enough, with your very kind and invaluable help, in organizing two symposia and urge the Committee to accept somebody younger, more energetic, and more well known, as the President of the Society. I propose Dr. P. K. Iyengar, Director of BARC and President of the Indian Radiation Physics Society."

The IRPS was established in Ferrara in September 1985, with officers including P. K. Iyengar as President and myself as Secretary. There was also planning at that time for future ISRPs. Anu Ghose was there to see the birth of his creation, and he continued to play an important advisory role in the following years. He witnessed the successful series of ISRPs, which he had initiated, and he witnessed the growth of IRPS, which he had envisaged.

In June 2002 at the IRPS Council meeting in Bologna, Anu Ghose and John Hubbell were designated Life Members of IRPS.

On a more personal note, the international cooperative programs with us in Pittsburgh which Anu Ghose had envisaged have also continued. We had a second NSF program in Penang beginning in 1990, and just this year we have begun a second Indo-US program in Calcutta, with Suprakash Roy and Barun Chatterjee at the Bose Institute.

I hope this gives some idea of the impact of Anu Ghose, on the field of radiation physics (as through the ISRPs and the creation of the IRPS), and on individuals working in the fields, as in my example.

Richard Pratt

ADVISORY BOARD REPORT

Malcolm Cooper, Chairman

FELLOWSHIP GRADE OF IRPS MEMBERSHIP

After careful deliberation the Council has approved the establishment of a FELLOWSHIP grade of membership for IRPS.

It is designed to acknowledge those who are internationally leading scientists in one or more area of radiation physics and in this respect it brings us into line with many other professional organisations. The guidelines are as follows:

- Fellows must be nominated by a current member of the Society and must consent to the nomination.
- Both current and prospective IRPS members are eligible for nomination.
- Applications must be supported by a brief (1 page maximum) summary of qualifying achievements and accompanied by a full CV.
- Applications will be considered by a Fellowship Committee whose membership is determined by Council. The Fellowship committee will be chaired by the immediate past President of the society (i.e. the chair of the IRPS Advisory Board) together with three other members of the Society, who are clearly of Fellowship standing. The IRPS current president will be ex-officio, a member of the Fellowship Committee.
- Applications will be considered against criteria such as: " Scientific publications, citations, awards and prizes. " Prominence in relevant national and international organisations. " Responsibility for the management and direction of major projects or facilities in radiation physics.
- The Society will inform all applicants of the outcome within 6 months of receipt of the application.
- There is no application fee but the membership dues for a Fellow will be twice that for a Member (the developed and developing nation differentiation will be preserved) and must be paid before fellowship status is conferred. (The unexpired portion of any previous membership fee will be credited.)
- Fellows of the Society will be permitted to style themselves as FIRPS.
- The composition of the first Fellowship Committee is Malcolm Cooper (Chair), John Hubbell, Dan Jones and Ladislav Musilek.

Applications, which should be sent to Malcolm Cooper either by post :

Prof M. J. Cooper,
Department of Physics,
University of Warwick,
Coventry, CV4 7AL, UK

or electronically : m.j.cooper@warwick.ac.uk

are invited from 1st January 2005 onwards.

REGIONAL VICE PRESIDENT'S REPORT

Suprakash C Roy, South East Asia

Even as I write this note, my mind is devastated by the tragedy that occurred along the coastline of South-East Asia and whose after-effects continue to unfold. The tragic scenes that we are witnessing on television drive home the point that we are helpless in the hands of Mother Nature, despite all our advances in science and technology. Our hearts go out to the families of the innocent victims, and I hope that all our friends are safe and well. Only report that I received is that of one of our scientists at Kalpakkam Research Centre lost his wife, who was washed away by the water which hit the residential complex of the centre. I convey my message of condolence to affected members of IRPS, if any, of South-East Asia.

Nature's wrath is inescapable. It does not discriminate between blue and white collars, between foreign tourists in a seaside villa or local fishermen on the coast. Death by natural disasters is as old as recorded history from the typhus epidemic in Athens in 430 BC to the Shaanxi earthquake of 1556 in China and, closer to home, the Bangladesh famine of 1974 and the latest tsunami that hit South-East Asia on December 26, 2004. Even as the death toll continues to rise, it is estimated that the magnitude will surpass the number of people that were killed in Hiroshima, which was estimated to be 140,000. The difference between the two is of course, that one is natural and the other man-made, and while it is possible to prevent man-made disasters, nothing can be done to control natural disasters.

The frequency of natural disasters is on the rise and has increasingly been having a more severe impact on the world in terms of human and economic cost. The reasons of increasing natural disasters, according to experts, are many, like environmental degradation, climate change, population growth especially in cities etc. While the number of lives lost has declined in the past 20 years, the number of people affected has risen. Thus, 8,000,000 people died from natural disasters in the 1990s compared with 2 million in the 1970s. However, the number of people affected by natural disasters has tripled to 2 billion in the last decade. Ironically the economic losses increase as the world becomes richer and more developed. The International Red Cross Society published an annual World Disasters Report in which it was reported that in the past two decades direct economic losses from natural disasters has multiplied five-fold to US$ 629 billion. In 2003 alone there were about 700 natural disasters which killed about 75,000 people and caused about US$ 65 billion damage. In the last decade in India, more than four thousand people died and about 3 crore (30 million) people were affected by disasters annually.

Natural disasters are uncontrollable, but the devastation which follows any natural disaster is not. Disasters are closely linked to poverty as they can wipe out decades of development in a matter of hours. Disasters are first and foremost a major threat to development and specifically to the development of the poorest and most marginalized people in the world . . . and ensure they stay poor, says Didier Cherpitel, the former Secretary General of the International Federation of Red Cross and Red Crescent Societies. More than 95 percent of all deaths caused by disasters occur in developing countries; and losses due to natural disasters are 20 times greater (as a percent of GDP) in developing countries than in industrial countries.

Natural disasters hit poor people the hardest, and therefore, implementing effective disaster recovery programs may be an effective means of reducing poverty. The message spread by the Worlds Bank's Hazard Management Unit, which is working with developing countries, is to plan for potential natural hazards as a developmental issue, instead of confronting them only as a humanitarian emergency when a crisis strikes. At the national level, disaster prevention needs to be an integral part of a country's development plans.

After the tsunami disaster, installation of an expensive (about US$ 20 million) tsunami warning system in the Indian Ocean has been on the card. Since many of the countries on the coastline of the Indian Ocean are developing nations, what is arguably more important than a hi-tech early warning system, is an improved communication system. American scientists monitoring the Pacific had allegedly over an hour's notice of the earthquake that triggered the tsunami in the Indian Ocean, but they did not know whom to contact in these South-East Asian countries. As such, installing high-tech instruments would be fruitless unless all countries in the region have an improved communication infrastructure in place. A tsunami-alert system is a combination of real-time sensors data-crunching computers and orbiting satellites, but more importantly it requires imparting training to the public and officials on how to respond to warnings.

Preventive measures and preparedness are the two basic components which can make a significant difference when it comes to protecting our development from natural hazards. Developed countries have been able to reduce human and economic losses with adequate safety measures and a better response system in the aftermath of any natural tragedy. Indian and State governments are now considering the amendment of building rules in areas more prone to earthquakes. While developed countries use established insurance mechanism to reduce property losses, developing countries like India divert funds from development programmes to emergency relief and recovery.

Tsunami is a Japanese term, meaning "harbour wave". A tsunami can be generated by any disturbance that displaces a large mass of water from its equilibrium position. Earthquakes, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis. A tsunami travels at a speed that is related to the water depth - hence, as the water depth decreases, the tsunami slows. The tsunami's energy flux, which is dependent on both its wave speed and wave height, remains nearly constant. Consequently, as the tsunami's speed diminishes as it travels into shallower water, its height grows. Because of this, a tsunami imperceptible at the middle of the sea may grow to be several meters or more in height near the coast. When it finally reaches the coast, a tsunami may appear as a rapidly rising or falling tide, a series of breaking waves. The word tsunami, which was relatively obscure and unknown in this part of the world even a month ago, has now become part and parcel of our vocabulary and has created interest on its formation and destructive powers.

While our hearts go out to the families of the innocent victims, we also pledge at the same time that as scientists, our duties will not cease with donations and relief work, but to remain in constant alert to avoid repeating mistakes.

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REPORT FROM MEMBER

Seventh Radiation Physics and Protection Conference

Professor Mohamed Ahmed Gomaa

Atomic Energy Authority, Cairo, Egypt

During the period from the morning of 27th November till mid day of 30th November 2004, the weather was excellent and more than 200 attendants participated in the opening ceremony.

1. Several General lectures (GL) were presented by :

- Prof A.I.M. Aly, President of the Egyptian Atomic Energy Authority - ***Sustainable Development and Activities of Atomic Energy Authority***.
- A. Gonzalez and K.Mrabit of IAEA : talks were presented by K. Mrabit - ***International Radiation Protection Standards and their application: IAEA Policies and Current Issues.***
- K. Mrabit presented his second talk - ***Regulatory Infrastructure and Education and Training***.
- H. F. Aly - ***TE Norm Waste: Assessment and Treatment***.
-

El-Naggar - ***Health Hazards of Man Made Environmental Radioactivity***.

2. Several Invited Talks were presented during the conference :

- Effect of Source and Environmental Factors on Rn-222 Air Concentration ***(A. Mamoon)***;
- Capabilities and Utilization of Egypt Second Research Reactor for Socio-Economic Development ***(A.K. Shaat, A. Helal and A. Shukr)***;
- The Application of Radiotracer Techniques ***(Farid El Doushey, Sweden)***;
- Integrated Management Program for Radioactive Sealed Sources in Egypt (IMPRESS) ***(K. El Adham)***;
- Physics Experiment on SESAME ***(M.N. Comsan)***;
- A Multi-Sensor System for Land Mine Detection ***(R.M. Megahid)***;
- Management of Radiation Burn ***(M. Shabon and A.F. El Bedewi)***;
  Review on the Uptake of Radionuclides by Some Fresh Water Aquatic Biota ***(W.E.Y. Abdel Malik, A.S. Ibrahim and R.M.K. EL-Shinawy)***;
- Safe Transport of Radioactive Materials, International Regulations and its Supporting Documents ***(R M K El Shinawy).***

3. One Panel Discussion titled ***Radiation Protection*** was held Tuesday morning where ICRP 2005 draft recommendations were discussed by participants and IRPA Egypt Society.

4. Eighteen Scientific Sessions as well as one Poster Evaluation Session were carried out during the conference, which could be classified into pure and applied physics and radiation protection :

Session 1: Natural and Man Made Radiation Sources - 8 presentations
Session 2: Neutron and Reactor Physics - 4 presentations
Session 3: Radiation Detection and Measurements - 4 presentations
Session 4: Applied Radiation Physics - 8 presentations
Session 5: Radiation Safety - 5 presentations
Session 6: Physics of Nuclear medicine - 7 presentations
Session 7: Medical Physics - 5 presentations
Session 8: Radiation Effects - 7 presentations
Session 9: Non ionizing radiation - 3 presentations
Session 10: Atomic Physics - 5 presentations
Session 11: Nuclear Physics - 5 presentations
Session 12: Land Mines - 3 presentations
Session 13: Radiation dosimetry - 6 presentations
Session 14: Theoretical Physics - 8 presentations
Session 15: Medical and Biophysics - 4 presentations
Session 16: Radiation Shielding - 4 presentations
Session 17: Environmental Presentations
Session 18: Radiation Protection Presentations Posters : 16 presentations

5. Among the distinguished presentations from junior radiation physicists were the following:

- Determination of the Equilibrium Factor and Dose Equivalent from Radium and its Progeny by SSNTDs. Presented by Dr A. EL Sersy from National Institute of Standards.
  (A. EL Sersy, H. EL Samman, A. Hussein and M. EL Hawary)
- On the source-detector effencies for gamma rays. Presented by ***(M Salem)*** from Alexandria University.
- Inductively Coupled Plasma Mass Spectrometric Measurements of REEs in some Geological Samples after Separation by Gradient Ion Chromatography. Presented by R. A.Mohamed from Atomic Energy Authority. ***(A.L Helal, N.F. Zahran, M.A. Amr, R. A. Mohamed and H.H. Mahmoud)***
- Effect of Acquisition Orbits and Matrix on the Accuracy of SPECT Imaging: Quantitative Evaluation in Cardiac Phantom. Presented by R. Ali from National Cancer Institute. ***(H. Farag, W. Khalil, R. Ali, S.H.A. Al-Lehyani and Hany A. Shousha)***
- A Dosimetry Study Comparing NCS Report 2 Versus IAEA TRS 398 Protocol for High Energy Photon Beam: an Experimental Study at NC1 Cairo. Presented by H.S.A Elenen, from National Cancer Institute. ***(E.M Attalla, H.S.A Elenen, and A.A. Elsayed)***
- In Situ Measurements of Particle Size Using Laser Light Scattering Technique. Presented by W Ghaly from Atomic Energy Authority. ***(W. Ghaly, M. Ragheb, A. Morsy, N.F. Zahran, Y. Badr and A. I. Helal)***
- Energy Levels, Oscillator Strengths and Lifetimes of Excited States in Sodium and Sodium-like Ions. Presented by W.O. Younis from Cairo University. ***(W.O. Younis, S. H. Allam and Th.M. El-Sherbini)***
- Fast Neutron Irradiation Effects on CR-39 Nuclear Track Detector for Dosimetric Application. Presented by M.H. Khader from Ein Shams University. ***(A. Ahmed Morsy, M.H. Kader, S.A. Nouh, M. Morsy, Z.M. El Meleegy)***
- Thermal Analysis of the ITER Blanket First wall. Presented by H.I. Shanbunder from Ein Shams University. ***(A.A. Badawi, H.I. Shahbunder, M.H. Khalil, M. Morsy)***
- Angular Energy Distribution of 252Cf Neutrons for Polyethylene, Graphite and Iron Shields. Presented by A.M. Reda from Zagaziq University. ***(A.M. Reda, W.A. Kansouh, I.I. Bashter and R.M. Megahid)***
- Study the Radiological Impact of NORM in Steel Industry Case Study: Egyptian Iron and Steel Company. Presented by W.F. Bakr from Atomic Energy Authority. ***(W.F. Bakr, S.A. El Mongy, M.S. El Tahawy and E. Saad)***

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PAPER

New SR Application Project in China

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1. INTRODUCTION

The project of the Shanghai Synchrotron Radiation Facility will be an advanced third generation synchrotron radiation light source. The major purpose in constructing the SSRF is to establish a multidisciplinary platform for both research in various frontier sciences and R&D for high technology in China. The performance of the SSRF, according to the present design, should make it among the top synchrotron facilities in the world when it is completed. The storage ring of the SSRF will be operated at 3.5GeV with about 3nm.rad emittance. It will be able to produce a very high brightness light beam both in the X-ray and soft X-ray region ranging from 0.1keV to 40keV, which will greatly facilitate research in the life sciences, material science, earth and environmental science and many other fields.

2. MAIN APPLICATIONS OF SSRF

There are already two synchrotron facilities in China. One of them is the BSRF (the Beijing Synchrotron Radiation Facility), a parasitic light source with the storage ring energy at 2.2/2.5GeV and operated mainly for high energy physics. The other is the NSRL (The National Synchrotron Radiation Laboratory, located at the University of Science and Technology of China, in Hefei city), a second generation light source with the storage ring energy at 0.8GeV and aimed at applications in the VUV and soft x-ray region. In China as well as worldwide, there is a rapidly increasing demand for high intensity hard X-rays for research in structural biology, materials, hard condensed matter, soft condensed matter etc. The SSRF caters for this strong demand, also opening up new fields of investigation in frontier sciences in China. Based on the broad survey and extensive discussions, the first group of SSRF beamlines has been proposed as follows:

- Macromolecular Crystallography
- X-ray Absorption Spectroscopy
- High Resolution X-ray Diffraction and Scattering
- Hard X-ray Micro-Focusing
- X-ray imaging and Medical Research
- Soft X-ray Coherent Microscopy
- LIGA and X-ray lithography

The first group of the beamlines will be constructed and completed almost simultaneously with the completion of the accelerator. The budget for these seven beamlines will be included in the whole project of SSRF. However, these seven beamlines, together with the beamlines on the NSRL and BSRF, can only meet a small portion of demand from the Chinese user community, which is already at the level of 500 users, and is expected to increase to about 2000 in a few years time.

A strong request for more macromolecular crystallography beamlines has been raised by users, with increasing demand for the structural information on proteins, viruses and macromolecular complexes, being essential for understanding of biological function and interaction, and also to sustain developments in the pharmaceutical industry and in industrial biotechnology. Several high throughput crystallography beamlines at the SSRF are thought to be indispensable to research of structural genomics in China.

The rapid development of research on materials, such as materials for nanostructures and magnetic materials, has called for better characterization of materials and better understanding of their electronic properties. Synchrotron radiation methods, such as x-ray diffraction, scattering, absorption spectroscopy and photoemission spectroscopy etc., can play very important roles in these fields. These are also the fields with the largest numbers of users in China. The beam time and the beam intensity provided by the existing beamlines at the BSRF and NSRL are far below the users' requirements, and this has put strong pressure on the SSRF for more and better beamlines.

X-ray imaging is another field in which great progress has been made in recent years with the advent of brilliant synchrotron light sources. Very broad applications of X-ray imaging in medical research, biology, materials science and the industry are attracting great interests. Synchrotron radiation has also become an extremely powerful tool for studies in molecular environmental science, geochemistry, catalysts, chemical reaction dynamics and many other fields. Quite a few beamlines at SSRF are needed to meet the basic requirements in these fields of study.

Planning for the second phase of SSRF beamlines is in progress. We propose that two to three new beamlines be constructed each year at the SSRF with the support of multi-channel funding sources after the completion of the first group of beamlines. The total number of beamlines at the SSRF is expected to reach 20 within ten years. A tentative program for these 20 beamlines (including the first group of beamlines) is shown in ***Table 1***.

TABLE 1 A tentative beamline program for the SSRF in ten years

APPLICATIONS	Number of Beamlines
Hard X-ray Beamlines	
Macromolecular crystallography for studies of various macromolecular systems	4
X-ray diffraction, XAFS, SAXS, diffuse scattering, reflection, standing wave, etc. and their combinations	4
Studies of various X-ray imaging techniques and their applications	2
Micro-focus and its applications in material science, earth science, environmental science and biology	2
Inelastic scattering/ magnetic scattering	1
Ultra-fast x-ray pulse techniques and the studies of dynamics	1
Soft X-ray and lower energy beamlines	
Soft X-ray microscopy and spectroscopy	1
Soft X-ray CD, MCD	1
Photoemission spectroscopy, PEEM, Photoelectron diffraction	2
Soft X-ray lithography, LIGA	1
Infrared	1

3. SCIENTIFIC APPLICATIONS AND DESIGN FEATURES OF THE FIRST GROUP OF BEAMLINES

1) Macromolecular Crystallography Beamline Scientific applications:

These are aimed at the structural determination of macromolecules and their complexes, as in for instance enzymes, protein-nucleic acid complexes, viruses, pharmaceutical targets, membrane proteins etc. The beamline will be optimized for MAD (Multiwavelength Anomalous Dispersion experiments), and is also suitable for single wavelength measurements.

TABLE 2 Macromolecular crystallography beamline design features

Source	In vacuum undulator	Photon energy range	5 - 20 keV
λ_u	2.5 cm	Energy resolution	$< 2 \times 10^{-4}$
N	80	Focused beam size (FWHM)	$0.15 \times 0.1mm^2$
B_{max}	0.7T	Flux at sample	$10^{12} \sim 10^{13}$ photons/s

2) XAFS Beamline Scientific applications:

This beamline is intended to provide for structural information on a variety of materials, including catalysts, metalloproteins, environmental contaminants etc. While in the main it is aimed at allowing general purpose XAFS, it may also be able to deliver other measurements, like diffraction and scattering.

XAFS with different detection geometry :

- Transmission XAFS
- Flouroescence XAFS
- Surface XAFS

TABLE 3 XAFS beamline design features

	Focused	Unfocused
Maximum horizontal acceptance mrad	1.0	1.5
Energy range keV	5 - 25	4 - 40 or higher
Energy resolution E/E	$\sim 10^{-4}$	$\sim 10^{-4}$
Photon flux at sample photons/sec	$>10^{11}$	$>10^{9}$
Spot size mm^2	0.5 x 0.5	< 50 x 2
Content of higher order harmonics	$<10^{-4}$	$< 10^{-2}$

3) High Resolution Diffraction and Scattering Beamline Scientific applications:

- Crystalline structure of powder samples;
- The structures of thin films, multi-layer films and one dimensional superlattice materials;
- The structures of surfaces, near surfaces and interfaces;
- Crystalline structure of small single-crystal molecules;
- Structural phase transition;
- The structures and properties of microparticle system and porous materials;
- The structures of catalysts, polymers and biological macromolecules etc.

TABLE 4 High resolution diffraction and scattering beamline design features

Source	Bending magnet
Energy range	4~30 keV
Acceptance	3 mrad(H) x 0.15 mrad (V)
Energy resolution	$<2 \times 10^{-4}$ (Si(311) monochromator) $<4 \times 10^{-4}$ (Si(111) monochromator)
Focusing spot size	~0.5(H) x 0.5(V) mm^2, 3.0(H) x 0.2(V) $mrad^2$
Photon flux at sample position	$>10^{11}$ photons/s (Si (111) monochromator)

4) Hard X-ray Micro-Focus Beamline Scientific applications:

Providing an X-ray beam in the energy range 4-40keV, for

- Micro X-ray fluorescence, permitting non-destructive trace-element analysis with micron resolution and sub-ppm sensitivity.
- Micro X-ray absorption spectroscopy, providing unique chemical information of oxidation state, coordination state, and the local environment.

- Micro X-ray diffraction, permitting, for example, structure determinations and the mapping of strain in interconnects on semiconductor chips.
- Computed X-ray microtomography, useful for examining the internal microstructure of materials.

TABLE 5 Hard X-ray micro-focus beamline design features

Source	Bending magnet
Energy range (unfocused) (focused monochromatic)	4 - 30 keV 4 - 34 keV
Energy resolution ($\Delta E/E$)	$< 2 \times 10^{-4}$
Spot size at sample	1 - 10 micron, adjustable
Photon flux at sample	$> 10^9$ photons/(μm^2. s.0.1%bw)

5) X-ray Imaging and Medical Research Beamline :

This is aimed at studies of different types of imaging techniques and their medical applications, including:

- Intravenous coronary angiography;
- Diffraction enhanced imaging for soft tissues, like mammography;
- Other applications as CT of the brain, micro-beam radiation therapy.

The main parameters of the beamline are as follows:

Source: Wiggler, N=10, λ_u=13.6cm, B_{max}=1.8T;

Key component: Bent Laue crystal monochromator, Four crystal monochromator;

Flux at patient position: ~ 10^{11}phs/ $s \cdot mm^2$

6) Soft X-ray Coherent Microscopy Beamline Scientific applications:

A powerful tool for studies of very high spatial resolution on various objects, including:

- Polymers, Biomaterials and Soft Matter
- Organic Earth Materials
- Engineering Polymers
- Surfaces and Interfaces

Experimental methods:

- STXM (Scanning Transmission X-ray Microscopy);
- XANES (X-ray Absorption Near Edge Structure).

TABLE 6 Soft X-ray coherent microscopy beamline design features

Source	Undulator, λ_u = 9.0cm, N = 50, B_{max} = 0.35T
Wavelength range	250 ~ 750 eV
Spatial resolution	50 ~ 150 nm
Spectral resolution ($E/\Delta E$)	3000 (nominal)
Flux output	10^9 (photons/ s/0.1%BW)

7) LIGA ***(the acronym derives from the German for the processes Lithographie, Galvanoformung, Abformung): use of lithography, electroplating, and moulding processes to produce microstructures, up to 1000μm high.)***

The LIGA beamline is aimed at developing technologies for micro-fabricating and for X-ray lithography. There is special interest from the local semiconductor industry in Shanghai, an industry which is becoming increasingly important in the local economy.

TABLE 7 LIGA and X-ray lithography beamline design features

Source	Bending magnet
Accepting angle : (horizontal) (vertical)	4 mrad 0.4 mrad
Energy range	1 - 8 keV
Spot size (horizontal	120 mm
Scanning range (vertical)	110 mm

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NEW MEMBERS and ADDRESS CHANGES

Welcome to New Members :

Dr Nneoyi Egbe, Nigeria Dr Samuel O Inyang, Nigeria	Dr Jonathan Carney, U.S.A. Dr Sung-Joon Ye, U.S.A.

New Members' addresses are listed in the Contact Members' Details (click on country next to name)

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