ANNEXURE 1

NEW FELLOWS — 2002

(effective 1 January 2003)

1. Dipankar Bhattacharya
(b. 29-5-1959)
Raman Research Institute, Bangalore
Sp: High energy astrophysics, neutron stars, and gamma ray bursts

2. Indranil Biswas
(b. 19-10-1964)
Tata Institute of Fundamental Research, Mumbai
Sp: Algebraic geometry, differential geometry, and deformation quantization

3. Tushar K. Chakraborty
(b. 10-4-1957)
Indian Institute of Chemical Technology, Hyderabad
Sp: Peptides and peptidomimetics, organic synthesis and bio-organic chemistry

4. V. Chandrasekhar
(b. 6-11-1958)
Indian Institute of Technology, Kanpur
Sp: Inorganic chemistry, organometallic chemistry, inorganic rings and polymers, and main-group chemistry

5. Probal Chaudhuri
(b. 21-11-1963)
Indian Statistical Institute, Kolkata
Sp: Robust and nonparametric statistics, biostatistics, and statistical computing

6. Pijush K Das
(b. 13-11-1952)
Indian Institute of Chemical Biology, Kolkata
Sp: Cell biology, membrane biochemistry, molecular parasitology, and glycoconjugates

7. Rajiv V Gavai
(b. 25-7-1954)
Tata Institute of Fundamental Research, Mumbai
Sp: Lattice field theories, quark-gluon plasma, and early universe phase transitions

8. Vikram Jayaram
(b. 3-10-1956)
Indian Institute of Science, Bangalore
Sp: Ceramics, thin films, and electron microscopy

9. Sharika N. Kaul
(b. 4-8-1949)
University of Hyderabad, Hyderabad
Sp: Condensed matter physics, phase transitions, and critical phenomena, magnetism, and magnetic materials

10. S.B. Krupanidhi
(b. 1-7-1951)
Indian Institute of Science, Bangalore
Sp: Ferroelectrics, III-V semiconductor thin films, epitaxy, solid state devices, and MEMS

11. S. Mahadevan
(b. 7-11-1953)
Indian Institute of Science, Bangalore
Sp: Regulation of gene expression in bacteria, microbial physiology, and microbial evolution

12. Shekhar C. Mande
(b. 5-4-1962)
Centre for DNA Fingerprinting and Diagnostics, Hyderabad
Sp: Macromolecular crystallography, and protein structure and function

13. U.K. Misra
(b. 10-4-1952)
Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow
Sp: Clinical neurology, neurophysiology, and tropical neurology

14. J. Nagaraju
(b. 6-11-1954)
Centre for DNA Fingerprinting and Diagnostics, Hyderabad
Sp: Molecular genetics, and evolution, genetics of silkmoths, and molecular marker genetics

15. R. Pitchappan
(b. 2-4-1946)

Madurai Kamaraj University, Madurai

Sp: Human immunogenetics, immunology of infectious diseases, and human genomics

16. G.V.R. Prasad
(b. 22-11-1958)

University of Jammu, Jammu

Sp: Vertebrate palaeontology & biostratigraphy, palaeoecology & palaeogeography, and evolution of mesozoic mammals

17. V. Purnachandra Rao
(b. 10-10-1955)

National Institute of Oceanography, Dona Paula

Sp: Marine geology, authigenic minerals, and paleoclimate

18. A. Ramachandra Reddy
(b. 5-6-1945)

University of Hyderabad, Hyderabad

Sp: Genetics, plant molecular genetics, and plant genomics

19. Varun Sahni
(b. 29-3-1956)

Inter-University Centre for Astronomy & Astrophysics, Pune

Sp: General relativity and gravitation, quantum theory in curved space-time, and cosmology

20. Anunay Samanta
(b. 16-1-1956)

University of Hyderabad, Hyderabad

Sp: Fluorescence spectroscopy, and photochemistry

21. Nimish A. Shah
(b. 4-2-1967)

Tata Institute of Fundamental Research, Mumbai

Sp: Ergodic theory on homogeneous spaces of lie groups, and its applications to number theory

22. Shobhona Sharma
(b. 5-2-1953)

Tata Institute of Fundamental Research, Mumbai

Sp: Molecular parasitology, parasite immunology, and parasite metabolism

23. Subrata Sinha
(b. 4-1-1958)

All India Institute of Medical Sciences, New Delhi

Sp: Molecular oncology and immunology

24. G. Venkateswara Rao
(b. 9-11-1944)

Vikram Sarabhai Space Centre, Thiruvananthapuram

Sp: Finite element methods, structural analysis, and smart structures

NEW HONORARY FELLOWS

1. George Guy Dodson

University of York, York, England

Sp: Structural biology, and macromolecular crystallography

2. K.R. Sreenivasan

The Abdus Salam International Centre for Theoretical Physics, Trieste

Sp: Fluid mechanics, and turbulence

ANNEXURE 2

FELLOWS DECEASED

1. Anil Kumar
(b. 10-4-1951, d. 2-11-2002)
Elected: 1995
Sp: Condensed matter physics, physics of complex fluids, and statistical physics

2. J.N. Kapur
(b. 7-9-1923, d. 4-9-2002)
Elected: 1965
Sp: Applied and industrial mathematics, entropy optimisation principles, mathematical modelling, and biomathematics

3. T.N. Khoshoo
(b. 7-4-1927, d. 11-6-2002)
Elected: 1961
Sp: Genetics, plant breeding, and environmental sciences

4. M.B. Lal
(b. 31-1-1907, d. 5-12-2002)
Elected: 1942
Sp: Zoology and parasitology

5. K.K.G. Menon
(b. 19-9-1927, d. 6-4-2002)
Elected: 1975
Sp: Biochemistry, microbiology and toxicology

6. N.A. Narasimham
(b. 15-8-1922, d. 8-4-2002)
Elected: 1966
Sp: Spectroscopy, astrophysics and atomic and molecular physics

7. A.R. Patel
(b. 12-5-1917, d. 3-12-2000)
Elected: 1975
Sp: Solid state physics, crystal growth and imperfections

8. P.R. Pisharoty
(b. 10-2-1909, d. 24-9-2002)
Elected: 1957
Sp: Atmospheric sciences, remote sensing, and hydrology

9. S.K. Pradhan
(b. 6-9-1929, d. 23-5-2002)
Elected: 1986
Sp: Organic chemistry, stereochemistry, reaction mechanism, synthesis and natural products

10. V. Puri
(b. 10-12-1909, d. 9-10-2002)
Elected: 1945
Sp: Plant morphology, general biology, taxonomy and floral anatomy

11. C.J. Saldanha
(b. 27-12-1926, d. 7-4-2002)
Elected: 1980
Sp: Angiosperm taxonomy, floristics and ecology

12. P.K. Sen-Sarma
(b. 1-4-1929, d. 29-7-2002)
Elected: 1984
Sp: Tropical forest entomology, termites, insect vectors of plant diseases, general forestry ecology, and environment

HONORARY FELLOWS DECEASED

1. T.O. Caspersson
(b. 15-10-1910, d. 7-12-1997)
Elected: 1963
Sp: Genetics

2. Lord Porter
(b. 6-12-1920, d. 31-8-2002)
Elected: 1989
Sp: Photochemistry

ANNEXURE 3

NEW ASSOCIATES — 2002

1. Siva R Athreya
(b. 7-1-1971)
Indian Statistical Institute, New Delhi
Sp: Stochastic analysis

2. Yogish I Holla
(b. 14-9-1974)
Tata Institute of Fundamental Research, Mumbai
Sp: Algebraic geometry

3. Quasar S Padiath
(b. 30-11-1971)
Stanford University, California
Sp: Human molecular genetics, and gene identification and molecular mechanisms in neuropsychiatric disorders

4. Anand Ranganathan
(b. 4-12-1972)
International Centre for Genetic Engineering and Biotechnology, New Delhi
Sp: Biosynthesis of designer antibiotics, and virulence determinants of tuberculosis

5. Shalivahan
(b. 10-3-1971)
Indian School of Mines, Dhanbad
Sp: Nonlinear inversion, and electrical and electromagnetic methods

ANNEXURE 4

THIRTEENTH MID-YEAR MEETING

(5–6 July 2002, Bangalore)

A. Special Lectures

1. S. Ranganathan, IISc, Bangalore
   Novel atomic configurations in metallics

2. S.M. Chitre, University of Mumbai, Mumbai
   Seismic sun and solar neutrinos

B. Public Lecture

K. Anji Reddy, Dr Reddy's Foundation, Hyderabad
Science for profit is profit for science

C. Lecture Presentations by Fellows/Associates

1. Satyajit Mayor, NCBS, Bangalore
   Functional and structural characterization of membrane raft in living cells

2. K.A. Balasubramanian, CMC, Vellore
   Is intestine "the motor" of distant organ injury in post-surgical complications?

3. Srabani Taraphder, IIT, Kharagpur
   Proton transfer reactions in proteins: Role of protein dynamics and hydration

4. Sunanda Banerjee, TIFR, Mumbai
   High energy physics and precision measurements

5. K.C. Kumara Swamy, University of Hyderabad, Hyderabad
   New chemistry of phosphorus-based systems

6. Namita Surolia, JNCASR, Bangalore
   The Fab end of Plasmodium FAS and more

7. K.S. Krishna, NIO, Goa
   Structure and tectonics of the northeastern Indian Ocean

8. K. Sankara Rao, IISc, Bangalore
   Calcium-mediated signalling in early plant development

9. Amitabh Joshi, JNCASR, Bangalore
   Experimental evolutionary biology: Testing evolutionary hypotheses in the laboratory

10. S.V. Dhurandhar, IUCAA, Pune
    Gravitational wave astronomy: A new window to the Universe

11. Abhishek Dhar, RRI, Bangalore
    Understanding transport in one-dimensional systems

12. Vijay B. Shenoy, IISc, Bangalore
    Adhesion instabilities in soft films

13. T.N. Venkataramana, TIFR, Mumbai
    Topics in discrete groups

14. S.V.S. Murty, PRL, Ahmedabad
    Mars and Earth: A comparative planetology

15. R.N. Mukherjee, IIT, Kanpur
    A synthetic journey within the domain of classical coordination chemistry and bioinorganic chemistry

16. Sudha Bhattacharya, JNU, New Delhi
    Retrotransposons in Entamoeba histolytica: Parasitic DNA in a parasite

ANNEXURE 5

SIXTY-EIGHTH ANNUAL MEETING, 2002

(8–10 November 2002, Chandigarh)

A. Presidential Address

1. K. Kasturirangan, Department of Space, Bangalore
   Recent advances in X-ray astronomy

B. (a) Symposium: Quantum Computing and Quantum Information

1. Anil Kumar, IISc, Bangalore
   Introduction and overview

2. R. Simon, IMSc, Chennai
   Classical information theory

3. Subhash Chaturvedi, University of Hyderabad, Hyderabad
   Quantum information theory

4. K.R. Parthasarathy, ISI, New Delhi
   Quantum computations and algorithms

5. Anil Kumar, Indian Institute of Science, Bangalore
   Experimental realizations of quantum computing

(b) Symposium: From Mantle to Monsoon: Himalayan Geodynamics and Climatic Change

1. Vinod K. Gaur, IIA, Bangalore
   Introduction to the symposium

2. B.N. Goswami, IISc, Bangalore
   The Himalayan mountains and predictability of the Indian summer monsoon

3. R.R. Yadav, BSIP, Lucknow
   Climate variability in the Indian region: High resolution proxy records

4. V. Rajamani, JNU, New Delhi
   Geochemistry of Ganga/Yamuna alluvium — Changing Himalayan provenance

5. S. Krishnaswami, PRL, Ahmedabad
   Contemporary silicate weathering rates in the Himalaya: Impact on CO_2 consumption

6. Peter Molnar, University of Colorado, Boulder, USA
   From the mantle to the monsoon, manifested in the growth of the Tibetan Plateau

C. Special Lectures

1. P.K. Kaw, IPR, Gandhinagar
   Collective modes in a strongly coupled dusty plasma

2. S.E. Hasnain, CDFD, Hyderabad
   Evolution of biology: Are we ready to play God?

D. Public Lectures

1. Mohan Maharishi, PU, Chandigarh
   Rasa siddhanta *and its social significance*

2. M.S. Raghunathan, TIFR, Mumbai
   Artless innocents and ivory tower sophisticates: Some personalities on the Indian mathematical scene

E. Lecture presentations by Fellows/Associates

1. Milind G. Watve, Abasaheb Garware College, Pune
   Science where culture matters: A neoclassical approach to explore untapped bacterial diversity

2. Umesh Varshney, IISc, Bangalore
   Ribosome recycling, the fourth step of protein synthesis in bacteria

3. T.G.K. Murty, ISRO, Bangalore
   Optical technologies for space imaging

4. Sunil Mukhi, TIFR, Mumbai
   The physics of branes

5. K. Veluthambi, MKU, Madurai
   Fine tuning of Agrobacterium Ti plasmid system for efficient plant genetic engineering

6. Y.D. Vankar, IIT, Kanpur
   Carbohydrates: Much more than mere sources of energy. Synthesis of biologically important carbohydrate molecules

7. S. Ramasubramanian, ISI, Bangalore
   Reflected Markov processes

8. S.K. Satheesh, IISc, Bangalore
   Enhanced aerosol loading over Arabian Sea: Natural or anthropogenic Enhanced aerosol loading over Arabian Sea: Natural or anthropogenic

ANNEXURE 6

REFRESHER COURSE IN EXPERIMENTAL PHYSICS

Extracts from the report by Course Directors (C.S. Sundar and Baldev Raj)

Since "Methods in experimental physics" is a broad area, and the individual requirements of various college laboratories are diverse, a coherent short-term course was considered appropriate that highlights the use of personal computers for data acquisition. The use of personal computers to collect analog data about physical systems, to convert this to digital form and to construct graphical models in approximately real time is an entirely appropriate educational use of the computer and provides experimentation with a powerful tool. Further, this provides the computer the same role as electronic instrumentation, -except that it is more flexible..

In developing the technical programme for the Refresher Course, an interface box, designed by J. Jayapandian (IGCAR Materials Science Division) that uses the parallel port of a personal computer was put together. This port, normally used for connecting to a printer, provides an elegant and inexpensive method for interaction of PC with peripheral components like ADC, DAC without any modification of the internal circuits of the computer. The interface circuit along with software, operating under LABVIEW, was designed such that it can be used for measurement and control of laboratory experiments. The application packages developed include: temperature measurement, light intensity measurement, RPM measurement, stepper motor drive, and waveform generation. Based on the above design, 30 units of the parallel port interface box were fabricated by Micro Automation systems, Chennai.

In addition a few experimental facilities were also set up that illustrate how a few simple physics experiments can be carried out in a college laboratory using this interface box. This involved apart from integration of the above mentioned basic packages, writing the necessary software for data acquisition and plotting and setting up of auxiliary experimental facilities such as furnaces, vacuum system etc.

The experimental packages developed include:

thermal diffusivity measurement through a measurement of temperature -increase following a light pulse;

resistance measurement as a function of temperature (RT minus 200^0 C) to illustrate the phase transition in Manganites;

capacitance measurement versus temperature: phase transition in $BaTiO_3$ .multi channel analyzer for nuclear counting experiments.

The scientific programme started with overview lectures cum demonstrations on PC architecture, interfacing standards, and the software (LABVIE\\rj to provide adequate background to appreciate the experiments and projects set up for the course. The course was structured such that it comprised of two lectures in the morning project work/ experiments in the afternoon and an evening lecture.

Project work and Experiments (carried out in batches of 4, on a round-robin basis)

Assembly and testing of the data acquisition card
thermal diffusivity through pulse transient
capacitance measurement of phase transition in $BaTiO_3$
resistivity measurement in manganites
resistivity at low temperature

In addition the following experiments were included that can be set up in a college laboratory:

chaos in a nonlinear circuit
measurement of the Johnson noise in a resistor: determination of the Boltzmann constant using Nyqvist relation
optical absorption; colour centres;
infrared spectroscopy;
measurement of the electron work function in W using the Richardson-Dushman equation
shear interferometer (set up by J. Sethuraman, a teacher-participant)

Morning Lectures

Innovative design of sensors (B. Saha); AC susceptibilty (T. Geetha Kumary); fourier methods in optics (J. Sethuraman); chaos in a nonlinear circuit (MC. Valsakumar); Raman scattering (R.Kesavamoorthy); infrared spectroscopy (M. Premila); high pressure experimentation (N. Subramanian); positron annihilation (G. Amarendra); neutrons as probes of materials (KR Rao); luminescence (K. Govinda Rajan); matlab & data analysis (HK. Sahu); FFT using MATLAB (Sanjith); X-ray diffraction (VS. Sastry); intensity correlation spectroscopy (BVR. Tata); SQUIDs in ultrasensitive measurements (MP. Janawadkar); lecture by participants (R. Shankar, Chetan Panchal); electron microscopy (VS. Raghunathan); ultrasonics (Anish Kumar); accelerator based experiments (KGM. Nair); .thin films & SIMS (A.K. Tyagi)

Evening Lectures

neutrinos: why detect them? M.V.N.Murthy, IMSc, Chennai
competition between energy & entropy: K.P.N.Murthy, MSD
quantum information & quantum computation: R.Simon, IMSc, Chennai
saturable absorption spectroscopy: R.Srinivasan, RRI, Bangalore
materials research issues & directions: Baldev Raj, IGCAR
activities of HBSCE: Pathare
reactor experiments: S.M.Lee, IGCAR

A special evening session was held to provide clarifications on the hardware & software of the interface box based on its usage by the participants. The participants took back with them the interface box and CD's containing the requisite software LABVIEW, MATLAB, and softwares for data analysis such as curvefit, crystal structure analysis programme etc. In addition, write-ups on the interface box,

softwares, circuit diagrams and photocopies of the 1ecture notes were provided to the participants. From the viewpoints expressed at the feedback session, it appeared that the teacher participants were happy with the content and execution of the Course. While not downgrading the effort, the participants felt that more time spent on project work / experiments would have made the whole exercise more useful. A very good rapport was established between the teacher-participants and the course faculty, and on the whole it was a pleasant and useful experience.

Finally, what has been executed at the Kalpakkam Refresher Course is just the first attempt that exposes college teachers to the merits of PC-based automation. In any exercise of this type, there is certainly a scope for improvement both in hardware and software. This can certainly come from the feedback based on its usage in a college laboratory .

ANNEXURE 7

REFRESHER COURSE IN SPECTROSCOPY, CHEMICAL REACTIONS AND BIOLOGY

Extracts from the report by the Course Director (S. Dattagupta)

In his inaugural lecture S. Dattagupta (SN Bose Centre, Kolkata) elaborated on the importance of such a course in present day science particularly when everything is becoming interdisciplinary. The role of basic sciences — physics, chemistry, mathematics and biology — in achieving deepest understanding of every natural phenomenon was aptly emphasized.

This course was organized with the following motivation: (a) The researchers who are fortunate enough to carry out competitive research with state-of-the-art instruments should share their understanding with participants. The sheer beauty and novelty of their modern research should help stimulate the participant's thought processes. (b) The discussion between speakers and participants should start some sort of collaboration where inter-diffusion of knowledge would be encouraged. (c) The participants will be able to incorporate the introduction of modern topics into the curricula of their respective institutions. (d) Lectures by various experts would demonstrate the strong inter-relationship between different branches of natural science. (e) The speakers, after free interaction with participants, who are also mind-trainers and science-doers, would be able to appreciate the modification (if necessary) of their research work suitable to the need of our country.

All lectures were for 90 minutes each and there were four lectures every day. The lectures were scheduled such that the inter-relationship between theory, simulation and experiments was emphasized. S. Dattagupta described at length various static and dynamic correlation functions and their relations to dielectric, rotational, NMR and electronic spectroscopies. Kankan Bhattacharyya (IACS, Kolkata) showed with explicit examples how absorption, emission and laser spectroscopy could be understood on the basis of the above correlation language. A Chakrabarti (SINP, Kolkata) emphasized the utility of various spectroscopic techniques in studying complex biological systems of protein folding, macromolecular self-assembly and biological membranes. P. Roy (Viswa-Bharati) added a quantum flavour to spectroscopy and experimental observables. S. Roy (Bose Institute, Kolkata) demonstrated NMR on a real sample with his state-of-the art NMR machine whereas C. Mukhopadhyaya (University of Calcutta) explained the underlying theory of NMR. Guchait talked on gas-phase laser spectroscopy and electron-transfer, RK Mohanty (Viswa-Bharati) on the primary basis of rotational and vibrational spectral lines and S. Bhattacharyya (Viswa-Bharati) on the introduction to cell biology. S. Sengupta (SN Bose National Centre, Kolkata) spoke on liquid state and various correlation functions. R. Biswas (SN Bose National Centre, Kolkata) gave several lectures on reaction rate, solvation dynamics in normal liquids and super-critical fluids, and also on diffusion of ions and neutral solutes in liquids. Simulation results, experimental observations and theoretical predictions were presented and compared wherever data were available, and future directions were discussed.

Two special sessions were organized – one conducted by A. Chakrabarti and Ranjit Biswas and the other one by P. Roy. The participants spoke about their experiences in the refresher course in a presentation for 10 minutes each in front of other participants and freely expressed their views.

ANNEXURE 8

REFRESHER COURSE IN IMMUNOLOGY

Extracts from the report:

Every morning there were three lectures on various aspects of immunology while in the afternoon practical sessions were held. The first series of lectures were on basic immunology, followed by immunology in relation to various diseases.

To begin with, Sudha Gangal (Univ. of Pune) gave a comprehensive overview of the immune system. Kalpana Joshi (Univ. of Pune) talked about antigens, antibodies and their interactions. In the lecture on B cell maturation and activation Milind Gore (NIV, Pune) emphasized on acquisition of surface markers, B cell receptors (BCR) and other accessory molecules required for B cell activation, during B cell maturation in the bone marrow from early B cell stage to mature B cells. The importance of products of MHC (major histocompatibility complex) genes in antigen presentation and transplantation rejection was well brought out during the lecture on MHC by Narendra Joshi (CRI, Mumbai). T cell maturation and activation was covered by Bhaskar Saha (NCCS, Pune). The role of cytokines and chemokines which are key molecules in immune response, was elucidated by Smita Singhani (Univ. of Pune). The complement system plays an important role in innate immunity, humoral immunity and anaphylaxis. Complement activation is a cascade of events activated by antigen-antibody complex. As explained by Jyotsna Thakre (NIV, Pune) there are alternative pathways of complement activation as well. Madhuri Thakar (NARI, Pune) summed up different effector mechanisms of humoral as well as cellular immunity. Mouse monoclonal antibodies (Mabs) and their genetically engineered counterparts are in the forefront today, as they bridge the gap between laboratories and clinic. Shubha Chiplunkar (CRI, Mumbai) described the ingenious method of creating hybridomas, a source of getting unlimited amounts of monospecific antibodies reacting against a single antigenic epitope and the limitations of using mouse Mabs in the clinic, although they have proved to be extremely useful as diagnostic reagents. 'Humanized' mouse Mabs have a bright future as therapeutic reagents in many diseases including cancer. Vaccines form a major part of studies in immunity. In fact, the science of immunology came into existence with the then permitted human experiments conducted using attenuated infectious agents or agents non-pathogenic to human to induce life long immunity, by great scientists like Jenner and Pasteur. Vaccination is perhaps the best way of preventing infections even today. MG Deo (Univ. of Pune) brought out the evolution in vaccinology beginning with use of whole cell live attenuated vaccines, inactivated vaccines, subunit vaccines, vectored vaccines, peptide vaccines, genetically engineered vaccines and naked DNA vaccines.

From here on the lectures were directed more towards applied immunology. These lectures were aimed at application of the knowledge of advances in immunology towards understanding the basic mechanisms in diseases having major immune component. Srikant Tripathy (NARI, Pune) talked about immune response to infectious agents with special reference to tuberculosis. Bhaskar Saha (NCCS, Pune) covered the topic of immunity in Leishmaniasis (Kala Azar), as an example of parasitic disease, commonly found in 6 states of India. Sharad Gangal (Thane) discussed with participants the different allergic manifestations with special reference to type I hypersensitivity. Inherited immunodeficiency diseases are a major cause of morbidity and mortality in children. Zeenath Currimbhoy (WCH, Mumbai) elegantly brought out the amalgamation of bedside observations and laboratory tests to understand the molecular lesions causing abnormalities in immune functions in the sick children. Acquired immunodeficiency syndrome (AIDS) caused by HIV infection has created a monster, a challenge for medical science and management today. Ramesh Paranjpe (NARI, Pune) apprised the participants with the clinical course of HIV infection, and the host and viral factors responsible for establishment of the disease.

These were followed by two lectures of clinical importance on autoimmunity by VR Joshi (PDHHRC, Mumbai) and on organ transplantation by Bharat Shah (PDHHRC, Mumbai). According to Shubha Chiplunkar (CRI, Mumbai) cancer cells can be regarded as altered self-cells that have escaped normal growth-regulatory mechanisms leading to uncontrolled proliferation and spread of clones of transformed cells. She discussed pros and cons of the concept of 'immunosurveillance' as well as the recently proposed 'danger model'. Mechanisms by which tumor cells evade host immune responses were highlighted. Many tumors down regulate MHC class I molecules or may lack the co-stimulatory molecules B7 and thus do not present antigen efficiently to T cells. Camilla Rodrigues (PDHHRC, Mumbai) said that the goals of an immunology laboratory should be to improve the availability, accuracy and precision of the various tests and assure correct interpretation and significance in clinical medicine. She described basic principles of immunological procedures commonly used in laboratory medicine. Problems in their interpretation were also highlighted using SLE as an example. Mulherkar (CRI, Mumbai) described recombinant DNA technology and basic techniques involved in gene therapy such as obtaining a construct of a gene of interest with promoter sequences, to clone the gene in appropriate non-pathogenic vector, packaging of the vectored gene and transfection into target cells. In her lecture on genetically manipulated animal models, she also described transgenic and gene knockout animal models. Giving a brief introduction to human genome project (HGP), she said that the physical genome mapping has identified more than 50,000 sequence tagged sites (STSs) at specific locations, which can act as identifiable markers on the genome. Anand Rao (HNHRC, Mumbai) who pioneered the studies on stem cell biology and stem cell banking in India gave an overview of the global status of stem cell research.

Each participant received two books titled 'Trends in immunology' and 'A laboratory manual of immunology' (edited by Sudha Gangal and MG Deo) specially prepared for the course.

Practical Sessions

Practicals were conducted each afternoon wherever possible by the participants themselves. Experiments using HIV material, FCM and microinjection were set up as demos, while the rest were performed by participants individually or in batches. Protocols for many additional

experiments were included in the laboratory manual. In some cases the exercise was given as a demonstration. Practicals began with Ouchtherlony gel diffusion technique, single radial immunodiffusion and rocket immunoelectrophoresis.

Visits

During the course, half-day visits were arranged to the following three institutions in Pune engaged in research related to immunology: the National Institute of Virology, the National Centre for Cell Sciences, and the National AIDS Research Institute.

Interactive session

There was an interactive session for participants as almost all of them were college/university teachers and were involved in teaching of immunology. Chairing the session MG Deo said that although the state-of-the-art of immunology is much better in India at present, the thrust appears to be on research. Immunology is taught as a part of biotechnology at several centers started by the DBT. Immunology is also taught as a part of microbiology. However, since the discipline now pervades all branches of biological sciences including medicine, it needs to be taught in a more systematic way in science colleges both at the under-and post-graduate levels. The following observations were made during the interactive session.

(a) Immunology should be taught at the UG level in combination with molecular biology, the two post Second World War frontier disciplines in biomedicine. The two options suggested were: (a) immunology along with molecular biology should be offered as the third choice in the B.Sc life science which currently offers, at many places, only zoology or botany, (b) immunology may be introduced as a special paper in M.Sc zoology and life sciences.

(b) UGC may be requested to include immunology as a special subject/paper at UG/PG level.

(c) A one-year PG diploma course in immunology may be introduced with full complement of theory and practicals.

(d) With the introduction of biotechnology, which provides better job opportunities, there is an exodus of students from subjects like microbiology and zoology to biotechnology. In the process, basic biological disciplines, which play a crucial role in fundamental discoveries, are progressively getting depleted of talent. If immunology and molecular biology are included as a part of pure biology science courses, this exodus may be curtailed.

(e) One of the problems in implementation of any new initiative in teaching of immunology is the shortage of teachers. Refresher courses in immunology should be conducted regularly for UG/PG teachers.

(f) Addition of immunology and molecular biology in basic science course will improve job opportunities for these graduates especially in pharmaceutical industries, in biomedical research and teaching.

(g) Teaching theory courses alone was not sufficient, practicals will have to be a part of UG /PG courses. At present, only a few serological techniques are being taught. Teaching institutions often lack minimum laboratory and animal facilities. Efforts should be made to provide at least a minimum infrastructure to UG/PG institutes to facilitate teaching of immunology.

ANNEXURE 9

REFRESHER COURSE IN CODING THEORY, CRYPTOGRAPHY AND DISCRETE MATHEMATICS

Extracts from the report :

RP Bambah (Panjab University) in his inaugural lecture talked on Kepler conjecture and Minkowski's conjecture. RL Karandikar (ISI, Delhi) gave two general lectures on "Role of randomness in cryptography". Starting from the very introduction of error correcting codes, Madhu Raka (Panjab University) discussed Hamming distance, sphere packing bounds, linear codes, generator matrix, parity check matrix, syndrome decoding, Hamming codes and codes built from mutually orthogonal Latin squares. Gurmeet Kaur (Panjab University) continued with cyclic codes, BCH codes and idempotents of cyclic codes. LR Vermani (Kurukshetra) highlighted quadratic residue codes and their extended codes.

In cryptography, AK Bhandari(Panjab University) started from classic cryptosystem and block ciphers, described public key cryptosystem RSA and discrete log and Knapsack cryptosystems and in the end described the use of elliptic curves in cryptography. Amora Nongkynrih (TCS, Hyderabad) spoke on primality testing methods and described the recent paper of Maninder Aggarwal (IIT, Kanpur) on primality testing.

In discrete mathematics, VC Dumir (Panjab University) discussed pigeon hole principle, inclusion exclusion principle, recurrence relations and generating functions and gave a number of examples and applications of each of these.

RJ Hans-Gill (Panjab University) gave an introduction to graph theory including Eulerian graphs, Hamilton graphs and chromatic number of graphs.

During discussion hours, the problem sets based on main lectures, which were given to all participants, were discussed.

In the second week participants were also given some time to speak on their work. YS Pawar (Shivaji University) gave a brief description of her work on lattice theory. Sumathi (Madurai), AK Venkatesh (Alliance Business Academy, Bangalore) and P Vijaya Saradhi (Bapatla Engg. College, Guntur) spoke on their work in graph theory. Vivek Kumar (IIT, Kanpur) spoke on numerical analysis.

ANNEXURE 10

REFRESHER COURSE ON PHYSICS OF EARTHQUAKES

Extracts from the report by V.K. Gaur

The refresher course proved to be a rich experience for the faculty and participants alike. Participants showed extraordinary alertness and enthusiasm despite long hours of work each day, partly because of their identification of the subject with aspects of classical physics in a new setting, and partly because of their intimate experience of the earthquake phenomena so commonly felt in northeastern India. Lecturers from Cotton College, Guwahati took special pains to master computational programs for the determination of earthquake parameters from seismograms, which they plan to introduce as a regular part of their physics undergraduate exercises.

The course began with a keynote lecture on "Earthquake perspectives" by Saurabh Baruah (RRL, Jorhat). The first week was devoted to refreshing participants' understanding of the basic aspects of mathematical methods including wave physics and integral transforms which would be needed for the main course. All lectures and problem-solving and computational exercises during this week were delivered and conducted by the faculty of Physics and Mathematics departments of Tezpur University. This proved to be extremely effective in engendering a genuine interest in this enterprise amongst the University faculty, which, in turn, was turned to great advantage in drawing them easily to participate in various ways during the main course. Lectures and computational exercises over the next two weeks were delivered by 4 invited scientists with considerable help from the local faculty during the afternoons. There were two lectures each morning and the afternoons were devoted to problem-solving and computational exercises.

A photocopy of Peter Shearer's Introduction to Seismology, donated by IIT Kharagpur, was given to each participant as well as a CD containing all the programs they had studied and used for the determination of earthquake location, origin time, and magnitude. A copy each of the *Scientific American* Series of Bruce Bolt's book Earthquake and geological discovery, was sent to 11 college libraries of northeastern India from where the participants had come.

There was a deeply appreciative feeling widely voiced on several occasions that the Academy by this initiative had added a new dimension to the academic environment of the region, and that the course will, in turn, go much further than initially imagined, in spurring new initiatives at college and university departments in northeastern India towards enriching teaching and research in physical sciences.

ANNEXURE 11

REFRESHER COURSE ON MOLECULAR GENETICS

Extracts from the report by Course Co-ordinator (M. Hussain Munawar)

Bacterial molecular genetics is currently taught in many institutions. In today's scenario many feel that this is an outdated discipline and only modern recombinant DNA technology and associated subjects are relevant. The objective of organizing this course was to dispel this view and show that bacterial genetics is indeed relevant even in today's context. In fact, as everyone knows many concepts were understood at molecular level using only bacterial systems as model ones and this trend continues even today.

The morning sessions everyday were devoted to two intensive lectures. The topics covered origins of bacterial genetics, mutations and mutagenesis, lateral DNA transfer (conjugation, transformation and transduction), fine structure mapping, genetics of DNA replication, mechanisms of regulation of gene expression, SOS and DnA repair mechanisms, translation and its regulation, RNA polymerase structure and function and biochemical regulation, stress response in *E.coli* and other organisms, informational suppression pertaining to suppression of missense and nonsense mutations, transposons, phage Mu and *in vivo* genetic engineering, genetics of gram positive organisms with special reference to *Streptomyces* and *Mycobacteria*, genetic manipulation in *Zymomonas mobilis*, pathogen diversity and disease susceptibility, chromatin structure and function with special reference to gene expression, and creating gene knockouts through homologues recombination.

The afternoon sessions were dedicated to practicals, sometimes extending to mid-night depending on the experiment. The experiments covered during the practicals include MNNG mutagenesis and isolation of mutants, ampicilin enrichment of auxotrophs, phase lysate preparation and plaque assay, P1 transduction and genetic mapping of a mutation, bacterial conjugation (gradient transfer), construction of recombinant deficient derivatives of *E.coli,* transposition and isolation of insertions in the *lac* operon of *E.coli* and induction and assay â-galactosidase. To enable the participants to understand the experiments better, a hands-on laboratory manual was also prepared and distributed to the participants.

ANNEXURE 12

REFRESHER COURSE ON QUANTUM CHEMISTRY

Extracts from the report by the Course Directors (E.D. Jemmis and M. Durga Prasad)

Quantum chemistry is considered to be one of the dreaded subjects in the M.Sc. programme in chemistry in most Universities. Many students look upon this as a final hurdle that they have to overcome, so that the course can be completed. This is a serious drawback, because a large percentage of research publications in experimental chemistry these days have a quantum chemistry component. Teaching of quantum chemistry has not changed in the country during the last 30 years. While the basics of quantum mechanics cannot change, advances in computer hardware and software have made numerical solutions to Schrödinger equation practical, albeit many approximation. This helps in relating the equations to observables in chemistry. In addition, application of ideas based on symmetry, overlap of orbitals and perturbation theory has brought a conceptual framework to think about chemistry. We reasoned that students would be more receptive to quantum chemistry if, in addition to formalistic treatment, numerical studies of specific problems and qualitative arguments to convert the outputs of programmes to 'understanding' are simultaneously provided. With this in mind, the present refresher course in quantum chemistry was planned.

Basic quantum chemistry, with all its mathematical background, is available in text books and also on the web in many courses, even worked out assignments and problem solving sessions, are seen. However, enough connection is not established in the minds of students between quantum chemistry and the rest of chemistry. Our emphasis in this course, therefore, was to teach the basics of quantum mechanics during the morning lectures and a hands-on session on the use of quantum chemistry on several experimental problems in chemistry in the afternoon. To achieve this, we have considered laboratory components where participants will put to practice, with the help of PCs, quantum chemical methods that they learn in lectures. Lectures on quantum chemistry and the mathematics background along with group theory were arranged, so that the relation between wave function and symmetry of molecular system is most optimally used in understanding chemistry. Attempts were made to show how the electronic structure methodologies developed are useful in designing molecules, materials and drugs. We also had some classes on molecular mechanics, often used in combination with semi-empirical and *ab initio* electronic structure theory.

The course started with a general mixer on 16 February, 2003 where we discussed the expectations and requirements of the course. The projected computational laboratory courses in the afternoon/evening session already brought up the issue of familiarity with computers. The exactly solvable problems of quantum mechanics were covered in the first few lectures with the mathematical backgound as well as group theory parallely following. The concept of electron spin and its many implications in chemistry was introduced in between. Once perturbation and variation methods were proved, approximate ways in which quantum mechanics can be used in chemistry was introduced. The laboratory courses started by calculating the molecular orbitals of H_2 using a semi-empirical method, using programs installed on PCs made available to participants. The program used was taken from the Chemistry CD developed by the Academy. There were several initial hurdles during computations. The biggest problem faced by participants was to specify the the position of atoms in a molecule as an input to the programme! Once writing down the internal coordinates was mastered, the participants learnt to select a Hamiltonian and a basis set and to do calculations using the program. The output of the program was the wave-functions (which are the molecular orbitals) and energies. The program also included several Mulliken and other overlap population analyses strategies, where the elctrons in the molecule were partitioned to different atoms and bonds. The process of converting numbers or coefficients of atomic orbitals to conventional molecular orbital pictures of textbooks and publications, was tedious and took more time requiring additional laboratory lessons.

The response to this programme has been overwhelming. There were days when the laboratory was not closed until 11.30 p.m. The idea behind these laboratory courses was to make the teacher participants confident using the programs given in CD once they get back to their colleges and universities. The qualitative ideas that we teach such as the Walsh diagram for the geometric distortion of a molecule. Influence of frontier orbitals on structure and reactivity and so on were drawn from the calculations and immediately compared with the morning lectures.

Emphasis was given to getting meaning out of molecular orbitals by giving several examples starting with water, CH_2, CH_3, CH_4 C_2H_6, $CH_3CH_2^+$, anomeric effect, hyper conjugation and other electronic structure ideas popular among chemists. Reactions such as 4+2-cycloaddition were studied using semi-empirical molecular orbital theory by each of the participants. They were encouraged to locate the transition state and through a frequency calculation establish the transition state as a true one. The participants also did calculations on inorganic complexes such as ferrocene, looked at the electronic structures, compared it to what would be obtained from a symmetry adopted linear combination method that they teach in the group theory in chemistry course. Electron correlations beyond the Hartree-Fock method was included in the programme in two lectures and density functional theory, which is now becoming very popular, was also introduced in two lectures.