International Atomic Energy Agency

United Nations Educational, Scientific and Cultural Organization

International Centre for Theoretical Physics

# News from ICTP

No. 68/69 March/April 1993

## Short Report on ICTP Activities in 1992

GENERAL

The International Centre for Theoretical Physics (ICTP) is a multidisciplinary institution for research and training for research. It was founded in 1964 by the current Director, Professor Abdus Salam, Nobel Laureate for Physics in 1979. It is operated by the International Atomic Energy Agency (Vienna) and UNESCO (Paris). Eighty-five percent of its annual budget comes from the Italian Government, while IAEA and UNESCO contribute the remaining.

ICTP was created in view of reaching several objectives:

- to help foster the growth of advanced studies and research in physical and mathematical sciences especially in developing countries;
- to provide an international forum for scientific contacts between scientists from all countries;
- to provide research facilities for its visitors, associates and fellows, mainly from developing countries.

The programmes of ICTP encompass a large spectrum of scientific disciplines from the most sophisticated subjects such as the ultimate structure of elementary particles, to more practical domains like remote sensing or telematics. The ICTP scientific disciplines are:

Fundamental Physics including Astro-Particle Physics,
Physics of Condensed Matter,
Mathematics,
Physics and Energy,
Physics of the Environment,
Physics of the Living State,
Applied Physics,
Physics of the Space,
Physics and Mathematics Teaching.

The activities of ICTP include several components:

a) Research activities
b) High-level training courses
c) Training at Italian Laboratories
d) External activities
e) Book and Scientific Equipment Donation Programme
f) Training laboratories.

Research is conducted throughout the year in Fundamental Physics, Condensed Matter Physics, Mathematics and Plasma Physics; and from 1 September 1992, also in Atmospheric Physics and Radiopropagation. There is a research group for each of these branches which operate very similar to a department of theoretical physics in a university, with a small number of long-term scientists, visiting professors, post-doctoral fellows and associates. During the year, there are from 30 to 40 researchers in each group. The research output is of the order of 450 preprints each year.

A large number of training colleges, workshops and schools are held every year. The majority of the participants are scientists who are already working at university-level institutions, and who come to ICTP for the exposure to new areas of work or to update their knowledge in a particular field of interest. Normally one of the directors of each course is from a developing country. The courses consist of lectures, discussion groups and practical exercises using permanent laboratory equipment and temporary laboratories set up for a specific course.

The ICTP computer facilities include a mainframe computer as well as personal computers for the training courses as needed. Instrumentation equipment on loan from other institutions is also made available to participants in the ICTP laboratories.

The ICTP has established four laboratories for training and research. They are:

a) The Microprocessor Laboratory
b) The Superconductivity Laboratory
c) The Lasers and Optical Fibres Laboratory
d) Atmospheric Physics and Radiopropagation Laboratory.

In addition to these activities, the ICTP has recently developed an advanced training programme leading to a Diploma after one year of study in High Energy Physics, Condensed Matter Physics and Mathematics.

Throughout 1992, the ICTP organized approximately 50 activities. These came from research activities, conferences, workshops and topical meetings on advanced subjects. From a scientific point of view, the ICTP 1992

*Inside:*

programme could be considered successful due to the excellent work of the course directors, for the enthusiasm of the participants and for the course subjects themselves. All experiments were carried out successfully, and most participants are continuing in their home laboratories the research started at ICTP.

The 1992 Adriatico Research Conferences were held with the aim of bringing together leading experts in different fields and to allow them to present their approaches and concepts for the interaction with other participants. An essential aspect of these conferences is to present the up-to-date status of the field in a way accessible to non-specialists: this usual pattern has been followed during all the Conferences.

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## Scientific Activities

FIELDS OF RESEARCH, TRAINING AND HIGHLIGHT OF ACTIVITIES

The main fields of research and training-for-research at the Centre in 1992 were: Fundamental Physics (High Energy and Particle Physics); Condensed Matter Physics (Condensed Matter Physics and Related, Atomic and Molecular Physics); Mathematics (Systems Analysis, Mathematical Ecology, Algebra); Physics and Energy (Nuclear Physics, Non-conventional Energy); Physics and Environment (Geophysics, Climatology and Meteorology, Physics of the Atmosphere); Physics of the Living State (Neurophysics, Medical Physics, Biophysics); Applied Physics and High Technology (Microprocessors, Communications, Lasers).

The second Diploma Course in High Energy and Condensed Matter Physics and the first one in Mathematics were held from 1 October to 31 December 1992 with the participation of 30 students.

From January to December 1992, 3585 scientists took part in the activities of the Centre and in the Programme for Training at Italian Laboratories, for a total of 4190.31 person/months. Of these, 52.58% were from developing countries, accounting for 74.86% of the total person/months.

Associate Members from developing countries numbered 441, and there were 376 Federated Institutes in developing countries.

FUNDAMENTAL PHYSICS

Research in high-energy, fundamental physics and astrophysics was carried out throughout the year with the participation of 199 scientists, including 109 from developing countries. The Diploma Course in high energy physics was continued during the year with the participation of 20, 10 of them from developing countries. A two-week Spring School on string theory and quantum gravity and Workshop on string theory held in April were attended by 28 physicists from developing countries from a total of 111 in all. A two-day Workshop on "The search for new elementary particles: Status and prospects" held in May was attended by 41 physicists, 11 of them were from developing countries. One hundred and forty-five physicists from developing countries out of a total of 241 took part in the Summer School on high energy physics and cosmology (June-July). The Second Trieste Conference on recent developments in the phenomenology of particle physics was held in October; the number of participating physicists was 93, including 41 from developing countries.

CONDENSED MATTER, ATOMIC AND MOLECULAR PHYSICS

Research was conducted throughout the year with 159 physicists. Among them, 127 were from developing countries. The Diploma Course in condensed matter physics was carried out throughout the year with the participation of 27, out of that 10 were from developing countries. A two-week workshop on "Atom-radiation interactions" held in February-March was attended by 44 physicists from developing countries; the total participants were 72. The Spring College in condensed matter on superconductivity was held in April-June for 8 weeks, with the participation of 132 physicists and out of that 85 were from developing countries. The Seventh Trieste semiconductor symposium on "Wide-band gap semiconductors" was held in June with a participation of 142 physicists, including 9 from developing countries. A Miniworkshop on strongly correlated electron systems was held in June-July with the participation of 67 scientists, out of that 25 were from developing countries. The 25th Anniversary Symposium on frontiers in condensed matter physics was held in June-September with the participation of 301 scientists, of which 208 were from developing countries. A Miniworkshop on non-linearity: "Dynamics and surfaces in nonlinear physics" was held in July with the participation of 48, out of that 18 were from developing countries. The Summer Course on low dimensional quantum field theory for condensed matter physics was held in August with the participation of 69 scientists, out of that 41 were from developing countries. The Conference on chemical evolution and the origin of life was held in October with the participation of 66 scientists, of which 34 were from developing countries. A Miniworkshop on methods of electronic structure calculations was held in August with the participation of 69 scientists, among them 41 were from developing countries. In total 1204 scientists took part in these programmes including 665 from developing countries.

MATHEMATICS

Research in mathematics was carried out throughout the year with the participation of 126 scientists of which 98 were from developing countries. The Diploma Course in mathematics was carried out throughout the year with the participation of 15 — among these 12 were from developing countries. A two-week workshop on dynamical systems was held in June with the participation of 105 scientists, out of that 63 were from developing countries. The School on dynamical systems was held in May-June with the participation of 93, including 54 from developing countries. The Advanced Workshop on arithmetic algebraic geometry was held in August-September and was attended by 138 scientists, out of that 75 were from developing countries. A Workshop on commutative algebra was held and the total number of participants was 127, out of that 58 were from developing countries. In total 604 scientists took part in these programmes, out of that 360 were from developing countries.

PHYSICS AND ENERGY

Research in Plasma Physics was

carried out throughout the year with the participation of 12 scientists from developing countries, out of a total of 18 participants. The Workshop on computation and analysis of nuclear data relevant to nuclear energy and safety was held in February and March with a participation of 64 scientists, out of that 39 were from developing countries. A Workshop and Conference on "Global change and environmental considerations for energy system development" was held in April and May with a participation of 72 scientists, including 41 from developing countries.

PHYSICS AND ENVIRONMENT

Research in intermediate term earthquake prediction and structure of the earth was carried out for eight months with the participation of 7 scientists, out of that 3 were from developing countries. A group of scientists carried out their research in the Atmospheric and Radiopropagation Laboratory from September to December with the participation of 13, out of that 12 were from developing countries. A two-week workshop on Mediterranean cyclone studies was held in May with the participation of 40 scientists, including 25 from developing countries. A Workshop on tropical climate variability and regional impacts was held in August with the participation of 36 scientists, out of that 16 were from developing countries. The School of physical methods for the study of the upper and lower atmosphere system was held in November with the participation of 75 scientists; among them 59 were from developing countries. The Second Autumn Workshop on mathematical ecology was held between 2-20 November with the participation of 101, out of which 56 were from developing countries. The Workshop on three-dimensional modelling of seismic waves generation, propagation and their inversion was held in November-December with the participation of 66, out of that 32 were from developing countries. In total 338 scientists attended these programmes, out of that 203 were from developing countries.

PHYSICS OF LIVING STATE

A College of neurophysics "Object recognition by man and machine: methods and tests of cognitive neuropsychology and neural computations" was held in March, with the participation of 67, out of that 39 were from developing countries. The College on medical physics: "Imaging and radiation protection" was held in August and September with the participation of 89 scientists, out of that 62 were from developing countries. The Fourth International Conference on applications of physics in medicine and biology was held in September with the participation of 148 scientists, out of that 70 were from developing countries. The College on methods and experimental techniques in biophysics was held from 28 September to 23 October with the participation of 81 scientists, including 61 from developing countries. In total 385 scientists attended these programmes, out of that 232 were from developing countries.

APPLIED PHYSICS AND HIGH TECHNOLOGY

The Microprocessors Laboratory carried out its activity in the whole year with 8 scientists from developing countries out of a total number 18. The High Temperature Superconductivity Experimental Laboratory carried out its research in the whole year with the participation of 17 scientists, out of that 12 were from developing countries. The Lasers and Optical Fibres Laboratory also worked throughout the year with the participation of 35 scientists, including 11 from developing countries. The Third Training College on physics and technology of lasers and optical fibres was held in January-February with the participation of 107, out of that 70 were from developing countries. The Computer Network Project was held in March and April with the participation of 86 scientists, out of that 58 were from developing countries. The Second College on Microprocessor-based real time control — "Principles and applications in physics" was held in October with the participation of 65 scientists; among them 54 from developing countries. In total 323 scientists took part in these programmes, out of that 213 were from developing countries.

ADRIATICO RESEARCH CONFERENCES

In 1992, the series of Adriatico Research Conferences included short meetings on: Polarization Dynamics, Clusters and Fullerenes, Wrinkling of Surfaces, Synergetics in Condensed Matter, and Hydrogen Atoms. Eighty-two scientists from developing countries, out of a total of 312, took part.

TRAINING AT ITALIAN LABORATORIES

One hundred and seven scientists from developing countries carried out research at Italian academic and industrial laboratories under a programme which started in 1982 with the financial support of the Italian Direzione Generale per la Cooperazione allo Sviluppo (Italian Ministry for Foreign Affairs, Rome, Italy).

EXTERNAL ACTIVITIES

In the fields of Physics and Pure and Applied Mathematics, the Centre sponsored 63 activities, courses, workshops and symposia in 24 countries. Fifteen Affiliated Centres were established in 15 countries and 4 Networks were created involving 25 countries, plus 5 Visiting Scholars. These programmes were financed by the Direzione Generale per la Cooperazione allo Sviluppo of the Italian Ministry of Foreign Affairs, Rome, Italy.

HOSTED MEETINGS

The Centre hosted 14 meetings. The organizing institutions were the International Centre for Genetic Engineering and Biotechnology; UNESCO; Third World Academy of Sciences; Italian National Institute for Nuclear Phyics; International Institute for Pure and Applied Chemistry; International School for Advanced Studies; International Ocean Institute; Politecnico of Milan; Sincrotrone Trieste.

OTHER MEETINGS

A three-day Round Table on "The Essential Role of Science in Technological Progress and Economic Development" was held in March in the Adriatico Guest House conference room. Professor Abdus Salam and Dr. Luis Emmerij, Director of the OECD Development Centre in Paris, chaired a panel of scientists, economists and professionals from Third World countries. The aim of the Conference was to narrow the gap between Science and

Economics and to find a strategy to be adopted in the future.

The "25th Anniversary Symposium on Frontiers in Condensed Matter Physics" was held on 10-11 July at the Main Lecture Hall of the Centre. Two Nobel Laureates, Prof. J.R. Schrieffer (Chairman of the ICTP Scientific Council) and Prof. K.A. Müller, and Prof. J. M. Ziman were the main speakers of the Symposium.

Prof. S. Lundqvist, former Chairman of the ICTP Scientific Council and Chairman of the Condensend Matter Physics Programme, described how the Condensed Matter Physics Programme came into the mainstream of the path and its success during the 25 years of the ICTP.

BOOKS AND EQUIPMENT DONATION PROGRAMME

In 1992, the Centre was able to distribute 17,300 journals, 16,050 proceedings, 1,600 books and 1,650 miscellaneous publications to some 1,500 institutions in 100 developing countries. Besides the donations directly distributed by the Centre, a large number of donations of complete sets of back-issues of journals were shipped directly by the donors to institutions in developing countries.

AWARDS

The 1992 Dirac Medals of the International Centre for Theoretical Physics were awarded to Professor Nikolai Nikolaevich Bogoiubov (posthumously) formerly of the Joint Institute for Nuclear Research, Moscow, Russia, and to Professor Yakov G. Sinai from Landau Institute for Theoretical Physics, Moscow, Russia. Professor Nikolai Nikolaevich Bogolubov was awarded in recognition of his many fundamental contributions in Physics and Mathematics. In Statistical Physics, his treatment of Bose-Einstein condensation in a non-ideal gas was a seminal work which laid the basis for a microscopic theory of superfluidity in Helium II.

Professor Yakov G. Sinai received the 1992 Dirac Medal for his outstanding contribution to Theoretical Physics and Mathematics through the development of Ergodic Theory and its applications to Dynamical Systems, in particular Billiards, Phase Transitions, Quantum Chaos and Hydrodynamics. Also cited is his work on the Spectral Analysis of Schrödinger Operators and Applications of Renormalization Group Theory.

The 1992 ICTP Prize, in honour of V.F. Weisskopf, was awarded to Dr. Élcio Abdalla, from the Universidade de São Paulo, Brazil, in recognition of his contributions in the field of High Energy Physics.

PREPRINTS AND INTERNAL REPORTS

In 1992, 433 preprints and internal reports were issued. ◆

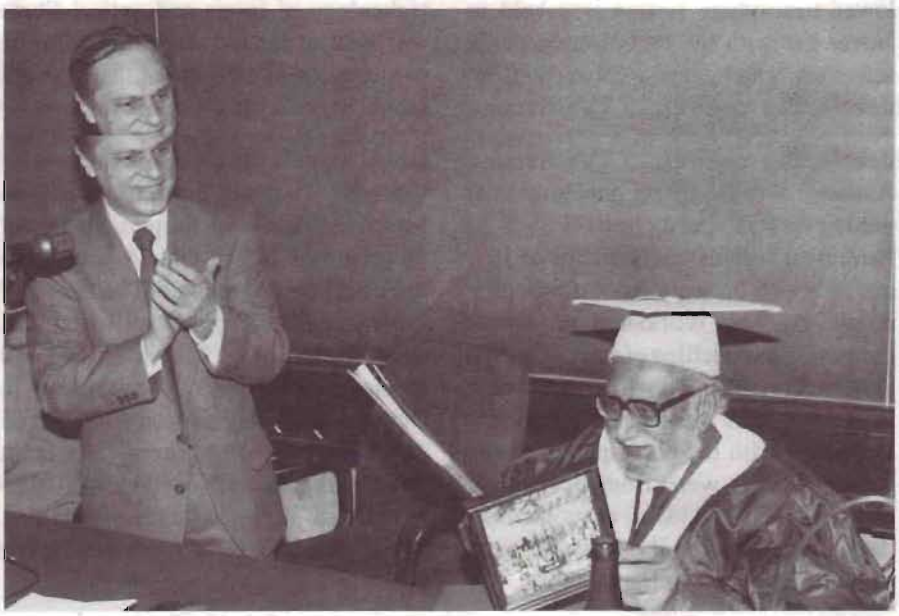
## Honorary D.Sc. Degree to Professor Abdus Salam

Professor Abdus Salam, Director of the International Centre for Theoretical Physics and President of the Third World Academy of Sciences, was honoured with the diploma of Doctor of Science, Honoris Causa, of St. Petersburg University, Russia. As Prof. Abdus Salam could not travel to Russia, the ceremony took place in the Main Lecture Hall of the ICTP, Trieste, on 10 March 1993. The Rector of the University of St. Petersburg, Prof. S. Merkuriev, awarded the Honorary D.Sc. Degree to Professor Abdus Salam. He read the citation for the degree. The original citation is as follows:

"It is both easy and difficult to speak about the achievements of Professor Abdus Salam. It is easy because Professor Salam has a unique personality and has achieved spectacular results. It is difficult because he has so many achievements in so many different fields of human activity.

Already in his young years it became evident that nature had provided him with a supertalent for Physics. At the age of 25, Salam produced his first masterpiece in Physics, and from then on the development of Physics was interconnected and largely inspired by Professor Salam's papers. More than 40 years have passed since that time. For Physics this means almost an era.

Among Salam's scientific achievements, the most outstanding is certainly the unification of the electromagnetic and weak interactions or — as Salam has coined it — the theory of electroweak interactions. All the remarkable predictions of the EW theory have been verified and now the theory is supported by all known experimental evidence. The theory itself looks like a miracle: having a rigid structure, it agrees with experiments of high accuracy. No



*Professor Abdus Salam, Director, International Centre for Theoretical Physics, and President, Third World Academy of Sciences, receiving the honorary D.Sc. degree from Prof. S. Merkuriev, Rector of St. Petersburg University, Russia, on 10 March 1993 in the Main Lecture Hall of the ICTP.*

real extension beyond the EW theory has been found up to now. New accelerators could give us an indication of what is in Nature beyond the EW theory. It is not excluded that the first extension of the EW theory would be the Pati-Salam theory.

The EW theory has started a new epoch in Physics. It was logical that the creators of the EW theory were honoured with the award of the Nobel Prize in Physics in 1979.

The Nobel Prize crowned Salam's best achievement in Physics. His contributions to Physics before and after the EW theory were also widely recognized. Salam is always at the centre of new ideas and has been the recipient of almost all prestigious prizes in Science.

However, for the past 30 years, Physics has taken up only part of Professor Salam's time and energy. He has made tremendous efforts to bring Science to the Third World and to develop the scientific community. Once again, Abdus Salam acts as a unifier. In Physics he unifies interactions, in society he unifies people through Science.

Professor Salam is the founder and Director of this beautiful International Centre for Theoretical Physics which became one of the main centres in Physics in the world. The Centre plays an outstanding role in promoting Physics and Science.

Professor Salam is a founding member and President of the Third World Academy of Science. He founded the Third World Network of Scientific Organisations. He launched the idea of an International Association of Centres for Advanced Study.

Professor Salam is one of the leaders of modern civilisation. It is natural that he plays a distinguished role in the Peace Movement and for almost 40 years has been actively associated with the United Nations.

St. Petersburg University confers on Professor Abdus Salam the Honorary Degree of Doctor of Science in recognition of his outstanding contribution to Science and to the development of civilisation." ◆

## Visit of the Minister of State and Deputy Prime Minister of Turkey

The Minister of State and Deputy Prime Minister of Turkey, Prof. Inönü, visited the International Centre for Theoretical Physics on 6th March 1993.

He met Professor Abdus Salam, Director of the ICTP and President of the Third World Academy of Sciences, and discussed the possibility of strengthening future scientific exchanges between Turkey and ICTP/TWAS.

Prof. Inönü is a great friend of Professor Abdus Salam. Already in 1960, he shared with Prof. Abdus Salam ideas on the setting-up of an international centre for theoretical physics. He is a Member of the Third World Network of Scientific Organizations (TWNSO).

After the morning discussions, he visited the main ICTP Library and the Trieste Research Area.

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## Interview with Prof. Inönü, Minister of State and Deputy Prime Minister of Turkey

**Q.:** Your Excellency, nearly thirty years ago you came to Trieste at the Centre recently created by Professor Abdus Salam, as a Visiting Professor. You are now a distinguished member of the Third World Network of Scientific Organizations (TWNSO) and Minister of State and Deputy Prime Minister of Turkey. You occupy a very high position in your country. Since your first visit, Abdus Salam has won the Nobel Prize in 1979 and has created a complex of scientific institutions in Trieste: the International Centre for Theoretical Physics (ICTP), the Third World Academy of Sciences (TWAS) and the International Centre for Science and High Technology (ICS). Two theoretical physicists with apparently different destinies. Can one discern, according to you, any convergence in these two exceptional careers?

**R.:** Let me first of all express my admiration for the accomplishments of Abdus Salam. I met him at the Princeton Institute for Advanced Studies where he came to work after obtaining his Ph.D. in Cambridge. I was in the same institute after my graduation at the California Institute of Technology. There we had many discussions on the future collaboration in research among physicists from developing countries. After Princeton, I returned to Turkey and was appointed at the Middle East University in Ankara where I taught theoretical physics and carried out research. Abdus Salam came to visit us from the Imperial College in London where he had moved in the meantime. It is at that time that he conceived the idea of creating an international centre for theoretical physics which would act as a nucleus for developing fundamental science in the Third World. I saw his endeavour grow year after year while, at the same time, he was pursuing his research in theoretical physics.

As for myself, I have dedicated my efforts to the development of science in my country. I have worked in several universities and have always enjoyed collaborating with Abdus Salam in his activities at the Imperial College or at the Centre of Trieste. I have been in politics for ten years. In this capacity, I have tried to contribute to the democratic development of my country. This is a long story. After the last election I was called to take part in the Government. This gave me the specific enjoyment of being in a position to do something for the development of science and technology in my country from the viewpoint of a Government representative. This is another possibility for acting in the direction of the development of science. This type of work in fact complements the action of the great centres of the world and, in particular, that of the International Centre for Theoretical Physics under the brilliant leadership of Abdus Salam. I believe that international centres, national institutions, and governments must collaborate in order to develop science all over the world. This is one way to contribute to improving the well-being of mankind, to reap the highest benefits from natural resources without using them up. Science must be used for the welfare of people, for their happiness and for their continued existence on this

planet. In this sense all these activities complement each other. Science provides the knowledge while politics in democratic countries assesses the needs of the people. Many of the answers to these needs are based on scientific knowledge. Therefore scientific activity and politics complement each other. For this reason I feel very happy today in visiting the ICTP and enjoying the company of Professor Abdus Salam.

**Q.:** Was your training as a theoretical physicist an advantage or a drawback in your political career?

**R.:** Politics is an entirely free enterprise in the sense that you are allowed to use any potentiality you possess, whatever your merits or whatever experience you have accumulated in your life. People do not ask where these potentialities come from, they only want and expect a great success in your present work. I believe that it helps very much if one has a sound background in positive science which keeps one in touch with the physical world. This helps in realizing one's ideas and good intentions for the people from one's country and from all over the world. it is important that utopias have a physical basis and therefore politicians must have a sort of background based on physics, engineering, physical understanding or on something solid.

**Q.:** One of the initiatives of TWNSO is the creation of a network of international centres for high technology and environment in the countries of the Third World. This initiative was discussed under your chairmanship at the Fourth General Conference of TWAS in Kuwait. Are there, according to you, good reasons for being optimistic for the materialization of this project?

**R.:** I am certainly optimistic and the reason for this is the example of Trieste with the ICTP, TWAS and the International Centre for Science and High Technology. I remember quite well how Abdus Salam strove to make steps forward in getting the ICTP established and in cultivating such an utopia. Creating a centre of international repute which was based on intellectual resources from the Third World was then thought as an impossible dream. This dream is now a reality and it is providing benefits not only to the developing countries but also to Trieste, Italy, the physics of Europe and of the world. In the same way, there will be difficulties at the beginning in the creation of a chain of centres as conceived by Abdus Salam. It will take some time to call the means required, the local governments and the international funding agencies. But I am convinced that the project will succeed for the benefit of the scientific community in general and, above all, for the Third World and that it will result in a better understanding among people. Politicians talk about the New Order and this New Order will be better than the old one if it is based upon sound knowledge, good will among people and if it is supported by the common efforts of men everywhere. One finds such men of good will in international centres, young scientists who are there to develop their potentialities or to work for helping their own peoples. This is why I am quite optimistic.

*A.M. Hamende*

*Professor Abdus Salam, Director, International Centre for Theoretical Physics, and the Deputy Prime Minister of Turkey, Prof. Erdal Inönü.*

## Conferences and Lectures

Dr. M. Kirane, a Post-doctoral student of the ICTP Mathematics Research Group, gave the seminar "Asymptotic behaviour for a system describing epidemics with migration and spatial spread of infection" at the Department of Mathematics of the University of Pavia, Italy, on 31 March. ◆

## Go West Fellowships

The ICTP will host a new programme called "Go West" which is a fellowship programme sponsored by the Commission of European Communities.

These fellowships are awarded for three months and are distributed within one calendar year. Fellowships will start as of April and continue throughout the year. Each fellow has been assigned to a specific scientific group which will be in charge of the fellow during the period of stay. ◆

## Visits to ICTP

Visits to ICTP

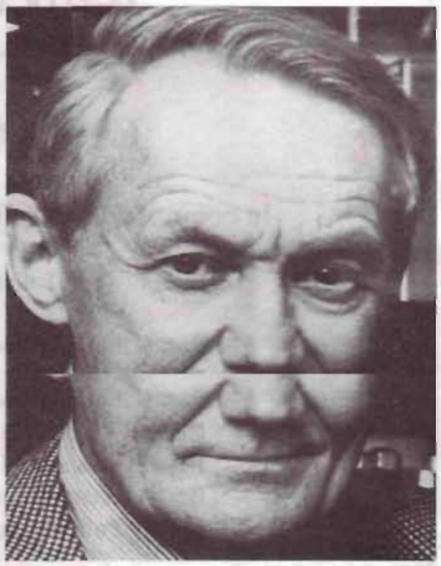
A delegation led by Prof. Kawata, Director of Planning of the Japanese Atomic Energy Research Institute, visited the International Centre for Theoretical Physics (ICTP) on 1 April 1993. The Director also met Prof. L. Bertocchi, the Deputy Director of the Centre, as well as the Scientific Information Officer, to discuss matters of mutual interest including matters related with research planning and the administrative set-up of the Centre. The delegation later visited the laboratories and the Library of the Centre in the afternoon. ◆

***Dorothy C. Hodgkin** (UK), 1964*
*"for her determinations by X-ray techniques of the structures of important biochemical substances".*
*Date of visit:*
*1988, October 3 – 7.*

***Thirty-five Nobel Laureates have visited the ICTP since 1964. The citations for the Prize and dates of their visits are given for five of them in this issue.***

***Robert Huber** (Germany), 1988*
*"for the determination of the three-dimensional structure of a photosynthetic reaction centre".*
*Date of visit:*
*1988, September 12 – October 7.*

***Leo Esaki** (Japan), 1973*
*"for his experimental discovery of tunnelling in semiconductors".*
*Date of visit:*
*1988, August 8 – 12.*



***Kai Manne Börje Siegbahn** (Sweden), 1981*
*"for his contributions to the development of high-resolution electron spectroscopy".*
*Date of visit:*
*1988, 6 – 7 December.*

***Rita Levi-Montalcini** (Italy), 1986*
*"for her work on growth factors".*
*Date of visit:*
*1988, October 3 – 7.*

## Ecologists Attend Introductory Course on Mathematical Computer Modelling

A week-long Introductory Course of Mathematical and Computer Modelling for Ecologists in Africa was held between 1-9 December 1992 at the Science Faculty of the Addis Ababa University, Ethiopia.

Attended by scientists from six African countries (Ethiopia, Ghana, Uganda, Congo, Tanzania and Kenya), the Course focussed on aspects concerning mathematical and computer techniques for analyzing and solving environmental problems related to sustainable development activities. The Course served the following three objectives:

- To bring together scientists working in the field of Biology, Medicine, Agriculture, Statistics, Mathematics, Environmental Physics, Environmental Chemistry, Economics, Geography, Sociology, Environment Management, etc. in order to enhance multidisciplinary approaches to solving ecological problems in Africa;
- to introduce the present role of Mathematical and Computer Modelling in carrying out ecological/ environmental/developmental investigations in Africa; and
- to encourage the inclusion of Mathematical Ecology in the curricula of African institutions of higher learning in Biological and Social Sciences.

The Course offered theoretical, methodological and technical aspects of conservation, epidemiology, resource management, water quality management and introductory mathematics, concepts of modelling and their practical utility either in research and training or in any other venture in order to approach problematic environmental issues.

Topics that were covered within the duration include:

Ecology, conservation and resources (Lecturer: Tewolde Berhan G.E., A.A.U., Ethiopia)

a. Ecological problems in tropical areas.
b. Conservation and applied ecology in the Tropics.

Epidemiology (Lecturer: L.S. Luboobi, Makerere University, Uganda)

a. Introduction to epidemiological modelling.
b. SI and SIR models.
c. SIS and SIRS models.
d. Sexually transmitted diseases.

Introductory mathematics (Lecturer: I.K. Dontwi, University of Kumasi, Ghana)

a. Introduction to modelling, population models and framework of modelling.
b. Linear and first order differential equations.
c. Simple interacting populations and equilibrium analysis.
d. Stability and classifications.
e. Prey-predator models/competition/ epidemics.

Ecological data analysis (Lecturer: Sun Chen Yong, IIEM, Trieste, Italy)

a. Analysis of ecological space (I and II)
b. Modelling vegetation climate interactions.
c. Presentation of multivariate data analysis software (I and II).

Multivariate data analysis techniques (Lecturer: Zerihun Woldu, A.A.U., Ethiopia)

a. Ordination methods and data analysis (I and II).
b Demonstrations of computer utilization and data analysis.

Environmental problems and life (Lecturer: Kiflemariam Melake, E.A.U., Ethiopia)

a. Ecological perspectives of environmental problems and life.
b. Drought problems and models for drought monitoring.
c. "Drought hypothesis" and rates of environmental changes.

THE 5TH INTERNATIONAL ENERGY CONFERENCE
18-22 OCTOBER 1993
SEOUL, KOREA

## ENERGEX '93

In conjunction with the TAEJON EXPO '93

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|---|---|
| THEME | ENERGY: The Challenge of a New Road to Development |
| SCOPE | – Rational Use of Energy |
| SCOPE | – Rational Use of Energy<br>– New & Renewable Sources of Energy<br>– Fossil Fuels and Clean Fuel Technologies<br>– Environmental Control and Waste Recycling<br>– Energy Policies and Economics |
| PLACE | Hotel Lotte World, Conference Room |
| CONTACT | Mr. Duk-Yung Jung, Secretary for ENERGEX '93<br>ENERGEX '93 Secretariat, KIER<br>P.O. Box 77 Taedok Science Town, Taejon 305-343<br>Republic of Korea<br>Tel: 042-861-6230 Fax: 042-861-6231 Tlx: KIEREL K45507 |

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d. Ecological monitoring, management and "Information Theory".

Weather models and long range forecasting (Lecturer: J.G. Wairoto, Meteorology Department, Kenya)

a. The area balancing figure in Periodic Area Balancing (PAB) technique.
b. Basic theory on Periodic Area Balancing (PAB) technique.
c. Demonstrations of the New Area Calculation Method (NACM) and major error sources of the PAB.

Environment and bio-physical phenomena (Lecturer: A. Elion-Mboussa, DGRST/ORSTOM, Congo)

a. Dispersion dynamics of two species in a heterogeneous space and periodically fluctuating environment (I and II).

This introductory course enabled to introduce the role of Mathematical and Computer Modelling in training, research and proactive or reactive measures to tackle ecological problems. It also facilitated the get together of a group of African scientists from various different disciplines.

A total of 26 scientists and one supportive staff attended the course. This represented ~70% of the total 37 invited and expected number of speakers and participants from Africa and Europe.

The International Centre for Science and High Technology (ICS), the Swedish Agency for Research Cooperation to Developing Countries (SAREC) and the Office for External Activities (ICTP) have participated jointly in organizing the Course.

This opportunity created an academic area which facilitated mutual understanding among the participants and by and large they all unreservedly supported the proposed multi-disciplinary approach to ecological problems. ◆

BANGLADESH MATHEMATICAL SOCIETY

## NINTH MATHEMATICAL CONFERENCE

UNIVERSITY OF RAJSHAHI
14-16 NOVEMBER 1993

**FIRST ANNOUNCEMENT**

The Bangladesh Mathematical Society is organizing a three-day conference on Mathematics to be held on 14-16 November, 1993, at Rajshahi University, Rajshahi. The Conference is co-sponsored by the University of Rajshahi.

The subject matter of the conference will be broadly divided into:

**PURE AND APPLIED MATHEMATICS**
**APPLICABLE MATHEMATICS**
**MATHEMATICAL PHYSICS**

A number of distinguished mathematicians from abroad are expected to participate in the Conference. Abstracts of papers are invited so as to reach the Secretary, Bangladesh Mathematical Society, or the Secretary of the Organizing Committee by May 15, 1993, and the papers in full by July 15, 1993. For additional information, please write to the Secretary, Bangladesh Mathematical Society, or the Secretary of the Organizing Committee.

Professor Farrukh Khalil
President
Organizing Committee and
Bangladesh Mathematical Society

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## A New High Tech Laboratory in Ghana

The Regional Laser and Fibre Optics Centre (RLFOC) of the University of Cape Coast, Ghana, was officially inaugurated during a ceremony which took place on 25 March 1993. The RLFOC is a research as well as a training institution which will serve the West-African region and which is focusing its activity on training science graduates. Its Staff and facilities will contribute to promoting research and fostering the exchange of ideas, scientific techniques and professional skills within the region, in the field of optical physics. Engineers, medical personnel and scientists as well as other professionals in biomedicine, environmental studies, communications, industry and scientific instrumentation will be offered opportunities for training. Dr. P.K. Buah-Bassuah is the co-ordinator of RLFOC.

Dr. P.K. Buah-Bassuah is the co-ordinator of RLFOC.

This new institution has close links with the International Centre for Theoretical Physics (ICTP) of Trieste and, in particular, with the ICTP Laser Group. Established in 1991, it became an Affiliated Centre of the ICTP in 1992. Through this affiliation status which was conferred upon recommendation of the Committee of the ICTP Office of External Activities, the RLFOC is entitled to five annual grants from the ICTP which should enable it to initiate programmes for research and training at the Ph.D. level. RLFOC also maintains close connections with another affiliated centre, the Department of Physics of the Cheikh Anta Diop University in Dakar,

Senegal, which conducts research on laser spectroscopy and applications of laser in medicine and environment.

Prof. G. Denardo, Head of the ICTP Office of External Activities and collaborator of the Third World Academy of Sciences (TWAS), attended the inauguration ceremony upon invitation of Prof. F.K.A. Allotey, TWAS Fellow and Chairman of the Ghana Atomic Energy Commission. During his visit, he was received by several Members of the Ghanean Government with whom he discussed further possibilities of collaboration between the Ghanean scientific community with the institutions in Trieste (TWAS, ICTP and the International Centre for Science and High Technology-ICS). ♦

## Obituary
## Prof. Polykarp Kusch

Professor Polykarp Kusch, who won the 1955 Nobel Prize in Physics for his contribution to understanding the internal mechanism of the atom, died after a long illness at his home in Dallas, Texas, USA, on March 20, aged 82. He was born in Blankenburg, Germany, on January 26, 1911. Prof. Kusch, the son of a Lutheran missionary, had been taken to the United States as an infant and spent the first few years of his life moving from town to town in the Mid-West. After the family finally settled in Cleveland, Ohio, he gained a science degree from the Case School of Applied Science, later getting a Ph.D. from the University of Illinois, where he taught for some years. With the outbreak of the second world war, Kusch

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## Awards

• A Ugandan scientist, Dr. Alex Tindimubona, has won the 1992 UNESCO/International Science Policy Foundation Swraj Paul Award for the promotion of science and technology policy. Dr. Tindimubona, 42, won the practical achievement award for his research and writing on the development of a science culture in Africa. He shared the honor with Prof. Fred Jevons of Australia who won the theoretical achievement award for his contribution to the development of science policy studies.

Dr. Tindimubona's research, carried out at the Nairobi-based African Academy of Sciences, concluded that the key to science-driven development lay in the deliberate embrace of science by African societies and its incorporation into their cultural traditions and practices. He has undertaken theoretical work to articulate the concept of science culture, which has led to the creation of an action program at the African Academy of Science.

This program aims at promoting a science culture in Africa through writing and publishing textbooks, studying the evolution of science and technology in Africa, drawing up models for the popularization of science on the continent, and putting together an African encyclopaedia of the social sciences. A continent-wide effort is now bringing together scholars and practitioners from many disciplines to develop and spread these ideas.

Born in Kigezi, Western Uganda, Dr. Tindimubona had his early education at Ntare School in Uganda, the University of Dar-es-Salaam in Tanzania, and the University of Alberta in Canada where he obtained a Ph.D. in quantum chemistry. From 1980 to 1988, Dr. Tindimubona lectured at the University of Nairobi, then joined the African Academy of Sciences in 1989 as a program officer and associate editor of its journal, *Discovery and Innovation*. In January 1993, Dr. Tindimubona returned to Uganda to continue his promotion of science and technology for development through the African Science and Technology Exchange (ASTEX).

Each Swraj Paul laureate receives 1,000 pounds sterling and a certificate.

• Roald Sagdeev, distinguished professor of physics and director of the East-West Space Science Center at the University of Maryland, has been awarded the John T. Tate International Award for distinguished service to the profession of physics from the American Institute of Physics. The prize cites his "pivotal contributions to the development of the space physics programme in the former Soviet Union and his leadership in supporting and advancing broad international co-operation in the study of physical phenomena in space".

• Victor Weisskopf, emeritus professor of physics at the MIT, has been awarded the Compton Award of the American Institute of Physics for "his leadership throughout the world in advancing science, in promoting peace and in seeking solutions to world problems".

• The 1993 King Faisal International Prize for Science has been awarded to Herbert Walther and Steven Chu for their work in quantum optics. The $93 000 science prize rotates annually between biology, physics, mathematics and chemistry. Walther, who is director of the Max Planck Institute for Quantum Optics and a professor of physics at Munich University, pioneered the field of quantum optics with his investigations of fundamental quantum phenomena, notably by trapping single photons and studying their quantum mechanical characteristics in a vacuum. Chu, who chairs the physics department at Stanford University, developed a technique of optical cooling and trapping for single positronium and muonium atoms and hence has been able to study delicate systems in experimental quantum optics. ♦

# Activities at ICTP in March-April 1993

**Title:** WORKSHOP ON SCIENTIFIC ASPECTS OF THE RURAL COMMUNICATIONS IN DEVELOPING COUNTRIES, 1 – 5 March.

**Sponsors and financial supporters:** International Telecommunications Union (ITU)-Telecommunications Development Bureau, International Union of Radio Science (URSI) and Italian National Institute of Geophysics.

**Organizer:** Professor S.M. Radicella (Programa Nacional de Radiopropagación, PRONARP, Buenos Aires, Argentina, and ICTP).

**Lectures:** Human development and telecommunications: a frame of reference. Radio spectrum management for rural telecommunications. Reports on countries' experience in rural communications (Brazil, China, Argentina, Nigeria, Sudan). Electronic atlas of VHF/UHF propagation for Africa. HF/VHF radio systems for rural-remote area telecommunications. Low availability systems for satellite communications. Economics and telecommunications in developing countries.

**Round table discussion:** Scientific and technical aspects of rural communications.

Visit to a factory.

Free time for library consultation.

The Workshop was attended by 48 lecturers and participants (46 from developing countries).
developing countries).

**Title:** ADRIATICO RESEARCH CONFERENCE ON QUANTUM INTERFEROMETRY, 2 – 5 March.

Co-sponsored by the Commission of the European Communities, Gruppo Nazionale di Elettronica Quantistica e Plasmi del Consiglio Nazionale delle Ricerche (Italy), Österreichische Forschungsgemeinschaft, and International School for Advanced Studies (SISSA).

**Organizing Committee:** Professors S. Lundqvist (Chairperson; Chalmers University of Technology, Göteborg, Sweden, and ICTP), H. Cerdeira (Co-chairperson; Universidade Estadual de Campinas, UNICAMP, Campinas, Brazil, and ICTP), E. Tosatti (International School for Advanced Studies, SISSA, Trieste, Italy, and ICTP), M. Tosi (Scuola Normale Superiore, Pisa, Italy) and Yu Lu (Academia Sinica, Beijing, P.R. China, and ICTP).

**Organizers:** Professors F. De Martini (Università "La Sapienza", Rome, Italy), G. Denardo (ICTP) and A. Zeilinger (Universität Innsbruck, Austria).

**Lectures:** Configuration space coupling in neutron interferometry. Ion interferometry and many-photon exchange of neutrons. Manipulation of quantum fields in a cavity by atomic interferometry. Optical tests of quantum mechanics. Extensions of Bell theorem, and proposals for new tests. Two-particle fringes dependent on the sum of the coordinates. Space-time correlations in photonic tunnelling. Diffraction and interference of atoms. Fun with the superposition principle. Electron holography: utilizing the phase of electron waves for structure analysis at atomic dimensions. Electron holography and its applications to flux line observation. Experiments with a separated beam atom interferometer. Back-action evasion measurements in a Penning trap. Coherence, indistinguishability, and the interpretation of the quantum state. Quantum interferometry in quantum cryptography. Quantum interference and communication. Advanced-wave interpretation and classical aspects of multiphoton interference. Two photon interference phenomena: quantum eraser, dispersion-cancellation, the
eraser, dispersion-cancellation, the
Franson experiment, and photon propagation through tunnelling barriers. Microcavity generation of pure N-photon states: the single-particle quantum-eraser. Negative probabilities in quantum mechanics. Recent work on dynamical reduction: achievements and expectations. Electron interferometry and holography of electrostatic fields. The one-atom maser as a which-way detector. Realizations of the EPR paradox using high-intensity fields. Experimental realisations of QND measurements. Physical origins of loss of interference in Welcher Weg detection. Precision measurements using atomic interferometry.

**Poster sessions.**

The Conference was attended by 75 lecturers and participants (22 from developing countries).

**Title:** CONFERENCE ON "HIGHLIGHTS OF PARTICLE AND CONDENSED MATTER PHYSICS", 8 – 12 March.

**Organizers:** Professors A. Ali (DESY, Hamburg, Germany), D. Amati (International School for Advanced Studies, SISSA, Trieste, Italy), J. Ellis (CERN, Geneva, Switzerland), S. Randjbar-Daemi (ICTP) and Yu Lu (ICTP).

**Lectures:** An experimentalist's overview of the rise and triumphs of the standard model. Beyond the standard model. Experimental results on B decays. Recent advances in flavour physics: theoretical aspects. Conformal symmetry and quantum space time. Fractional quantum numbers and gauge forces in condensed matter: parallels with the standard model. Electronic transport in two-dimensional, one-dimensional and zero-dimensional semiconductor systems. Point-like structure in string theory. Unified models based on Grassmann co-ordinates. Unity with SU(4)-colour — twenty years later. Singularities and string theory. The dawning of gauge-theory. Spin systems and sigma models. The APE project: numerical simulation of QCD and parallel computing. Carbon 60. Physics at HERA: present status and future prospects. The physics of small-x-behaviour in QCD. Experimental studies of CP violation and rare decays. Scientific activity at Gran Sasso (Italy). Solar neutrinos. Dark matter and massive neutrinos. Novel superconductors. The
neutrinos. Novel superconductors. The
sky is the limit. Gravity effects from superstrings. Twenty years of the Weyl anomaly. Kappa symmetry and supergravities in diverse dimensions. Particle physics in non-commutative geometry. W strings. Two-dimensional QCD as a string theory. Dynamical electroweak breaking: issues and challenges. Neutrinos and cosmology. Is baryon number conserved? Electroweak answer after 20 years. Genesis of unified gauge theories — personal recollections from Imperial.

The Conference was attended by 111 lecturers and participants (50 from developing countries).

*Workshop on representation theory of Lie groups, 15 March – 2 April.*

**Title:** WORKSHOP ON REPRESENTATION THEORY OF LIE GROUPS, 15 March–2 April.

**Organizers:** Professors J.H. Rawnsley (University of Warwick, UK) and J.A. Tirao (Centro de Investigación y Estudios de Matemática, Córdoba, Argentina).

**Lectures:** Hopf algebras. Representation theory of Kac-Moody algebras and G/B. Star products and quantum groups. All around square roots of fields and massless particles. Deformation quantization. Algebraic D-modules and representation theory of semi-simple Lie groups. Deformations, closed star products and cyclic cohomology. Unitary irreducible representations of semisimple Lie groups. Unipotent representations and the reductive dual pairs correspondence. *-products on Kähler manifolds. Lie Poisson structures and their linearisability. Representation theory of Kac-Moody algebras and G/B. On representations of quantum groups. Representations of Lie groups and the geometry of flag manifolds. An introduction to quantum groups. Unipotent representations and the reductive dual pairs correspondence. Unitarizable representations of the conformal quantum group at roots of 1. Algebraic aspects of Yang-Baxter equations. The resolvent of the Laplacian on negatively curved locally symmetric spaces of finite volume. On quantization of representations at roots of unity. Spherical functions on certain non-symmetric harmonic manifolds.

**Directors' Report:** The Workshop was the second on the Representation Theory of Lie Groups and Applications held at the ICTP after an interval of more than six years following on from a College held in 1985 and a Workshop in 1986. In the intervening years a Workshop on the same subject was held in 1989 in Córdoba, Argentina, supported partially by the ICTP. Plans are under way to hold another in the series in Córdoba in 1995.

The purpose of the Workshop was to present the latest results in Representation Theory to the group of people which the previous meetings had identified as actively working in this field and to introduce them to the related area of Quantum Groups through deformation theory.

There were 72 participants from 26 different countries.

The Workshop consisted of 4 lectures per day for 3 weeks with informal seminars after the lectures where it was possible for the participants to present their own work. With a well spaced out programme there was ample opportunity for contacts to be made between lectures. The lectures had substantial audiences throughout. Some of the more specialized lectures were intended for experts in the subject and drew smaller audiences.

The lecture courses were all accompanied by notes which were distributed during the Workshop. Several sets of notes were produced using the excellent TeX facilities provided by the ICTP.

A special session was held in which the lecturers presented open problems in their field which would be especially suitable for the participants to work on.

The average standard of the applications to participate in the Workshop was noticeably higher from many countries than for the previous workshops at the ICTP. About half of the participants were from the previous meetings in the series who have been active in the field in the intervening years, and the other half represent new contacts with mathematicians in developing

countries including several in countries which were not represented before.

The topics covered in the Workshop were the representation theory of semisimple Lie groups and the structure and representation theory of quantum groups. These are closely related and many people are working in both fields and attending the same lecture courses.

The scientific facilities at the ICTP are first class, particularly the Library, and participants were encouraged to make full use of the opportunity to obtain research materials to enable them to continue working in the subject after returning home.

We take the opportunity to thank Prof. Salam and the ICTP for making possible the organization of this Workshop, in particular we are very grateful to the Mathematics Section for all the help received.

*John H. Rawnsley, University of Warwick*
*Juan A. Tirao, Universidad de Córdoba*

The Workshop was attended by 72 lecturers and participants (50 from developing countries).

**Title:** SPRING SCHOOL AND WORKSHOP ON STRING THEORY, GAUGE THEORY AND QUANTUM GRAVITY, 19 – 29 April.

**Organizers:** Professors R. Dijkgraaf (University of Amsterdam, The Netherlands), R. Iengo (International School for Advanced Studies, SISSA, Trieste, Italy), I. Klebanov (Princeton University, USA), K.S. Narain (ICTP) and S. Randjbar-Daemi (ICTP).

**Lectures:** Constructive quantization of black holes. Batalin-Vilkovisky quantization of string theories. High energy scattering and quantum black holes. Developments in 2d string theory. Topics in topological field theory. Matrix models and strings. Is space-time discrete in 2+1 dimensional gravity? Topics in multi-colour QCD. Exact results for N=2 theories. Towards a string theory of QCD.

The School and Workshop were attended by 155 lecturers and participants (52 from developing countries).

**Title:** INTERNATIONAL SYMPOSIUM ON "INTRACELLULAR CHANNELS, ORGANELLES AND CELL FUNCTION", 21 – 23 April.

In co-operation with the International School for Advanced Studies, SISSA, Trieste, Italy.

**Organizing Committee:** Professors A. Cattaneo (SISSA), E. Cherubini (SISSA), A. Falaschi (International Centre for Genetic Engineering and Biotechnology, ICGEB, Trieste, Italy), O. Moran (Instituto Intrnacional de Estudios Avanzados, Caracas, Venezuela), A. Nistri (SISSA), R. Rahamimoff (Hebrew University, Jerusalem, Israel), F. Ruzzier (University of Trieste, Italy) and M.C. Sorgato (University of Padua, Italy).

**Scientific Advisory Committee:** Professors M.J. Berridge (University of Cambridge, UK), H. Betz (Max-Planck-Institut für Hirnforschung, Frankfurt, Germany), E. Carafoli (Eidgenossische Technische Hochschule, Zurich, Switzerland), E. Cherubini (SISSA), F. Conti (Istituto di Cibernetica e Biofisica, Genoa, Italy), R. Latorre (Centro de Estudios Científicos, Santiago, Chile), J. Meldolesi (University of Milan, Italy), C. Miller (Brandeis University, Waltham, USA), O. Moran (Instituto Intrnacional de Estudios Avanzados, Caracas, Venezuela), E. Neher (Max-Planck-Institut für Biophysikalische Chemie, Göttingen-Nikolausberg, Germany), R. Rahamimoff (Hebrew University, Jerusalem, Israel) and M.C. Sorgato (University of Padua, Italy).

**Lectures:** Intracellular calcium channels and calcium spiking. Molecular biology of the $IP_3$ receptor. Electrophysiology of ER and SR $Ca^{2+}$ release channels. Domain recognized by anti-ryanodine receptor antibodies which affect $Ca^{2+}$-induced $Ca^{2+}$ release. Calcium activated $K^+$ channels. Quality control of newly synthetised immunoglobulins. Relationships between endoplasmic and sarcoplasmic reticulum. Widespread pattern of expression of the genes for three ryanodine receptors in mouse tissues and cell lines. Regulation of the outer mitochondrial membrane channel, VDAC. Electrophysiology of the inner mitochondrial membrane. Translocation of proteins across the outer and inner mitochondrial membranes. ATP controls nucleo-cytoplasmic passive traffic in *in situ* nuclei of Xenopus oocytes. Passive and mediated transport across the nuclear envelope. Towards the 3-D molecular structure of the nuclear pore complex. Effect of basic peptides on the mitochondrial outer membrane cationic channel. Can a protein catalyse its own insertion into a membrane? Inner mitochondrial membrane channels activities. New frontiers in ion imaging: local control of $Ca^{2+}$ and $Na^+$. Neurotransmitters release from nerve terminals: a $Ca^{2+}$ regulated multiprotein process. Traffic of synaptic vesicles in neurons and endocrine cells. Cellular, intracellular and membrane oscillations in presynaptic nerve terminals. Control of synaptic vesicle cycling by GTP-binding proteins. Three distinct fusion processes during eosinophil degranulation. A diffusible messenger released by emptying of intracellular calcium stores.

**Round Tables:** Structural and functional homologies of ER and SR membranes. Function of nuclear and mitochondrial channels.

**General discussion:** The ryanodine receptor.

**Poster sessions.**

The Symposium was attended by 144 lecturers and participants (14 from developing countries). ♦

*Prof. Polykarp Kusch —*
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joined the Radiation Laboratory of the National Defence Research Committee, working on the high-frequency oscillators that were to have important applications in the field of radars.

He moved to Bell Telephone Laboratories in 1944, spending two years on the development of vacuum tubes and microwave generators, and then joined the faculty of Columbia University where he taught until 1971 before moving to the University of Texas at Dallas. He retired in 1982. Prof. Polykarp Kusch is survived by his wife and five daughters. ♦

# Calendar of Activities at ICTP in 1993

## 1993

Sixth Workshop on perspectives in nuclear physics at intermediate energies ..... 3 – 7 May

Workshop on qualitative aspects and applications of nonlinear evolution equations ..... 3 – 14 May

Course on ocean-atmosphere interactions in the Tropics ..... 10 – 29 May

College on computational physics ..... 17 May – 11 June

Spring College on plasma physics ..... 17 May – 11 June

Summer School in high energy physics and cosmology ..... 14 June – 30 July

including

Third School on non-accelerator particle astrophysics ..... 28 June – 9 July

Miniworkshop on strongly correlated electron systems ..... 21 June – 9 July

Research Workshop in condensed matter, atomic and molecular physics ..... 21 June – 3 September

Adriatico Research Conference on strong correlation phenomena at low carrier density ..... 22 – 25 June

Adriatico Research Conference on scattering from surfaces ..... 6 – 9 July

Workshop on the liquid state of matter: opportunities from new radiation sources ..... 19 – 30 July

Miniworkshop on non-linearity: chaos in mesoscopic systems ..... 26 July – 6 August

Adriatico Research Conference on mesoscopic systems and chaos, a novel approach ..... 3 – 6 August

Conference on variational problems in differential geometry and partial differential equations ..... 16 – 20 August

Adriatico Research Conference on vortex fluctuations in high $T_c$ superconductors ..... 17 – 20 August

Working Party on mechanical properties of interfaces ..... 23 August – 3 September

Working Party on mechanical properties of interfaces ..... 23 August – 3 September

Workshop on materials science and physics of non-conventional energy sources ..... 30 August – 17 September

Course on geometric phases ..... 6 – 17 September

College on soil physics ..... 6 – 24 September

Second Workshop on composite media and homogenization ..... 20 September – 1 October

Workshop on telematics ..... 27 September – 22 October

Conference on the origin of life ..... 25 – 29 October

Second School on the use of synchrotron radiation in science and technology:

"John Fuggle Memorial" ..... 25 October – 19 November

Second Workshop on non-linear dynamics and earthquake prediction ..... 22 November – 10 December

## 1994

ICTP-UNU-Microprocessor Laboratory: Third Course on basic VLSI techniques ..... 10 January – 4 February

5th Training College on physics and applications of lasers and optical fibres ..... 24 January – 11 February

Follow-up to the Workshop on preparation of radiomaritime master plans for English-speaking African countries ..... 7-18 February

College on physics of archaeometry and preservation of work of art ..... 7 – 25 February

Winter College on quantum optics ..... 14 February – 4 March

Workshop on study of atmospheric interactions by remote sensing ..... 21 February – 4 March

Workshop on science and technology of thin films ..... 7 – 25 March

Workshop on fluid mechanics ..... 7 – 25 March

Workshop on radiation protection in diagnostic radiology ..... 16 – 25 March

Spring School and Workshop on string theory, gauge theory and quantum gravity ..... 11 – 22 April

Workshop on nuclear reactors — physics, design and safety ..... 11 April – 13 May

Spring College on quantum phases ..... 3 May – 10 June

International Monsoon Conference ..... 9 – 13 May

Workshop on commutative algebra and its relation to combinatorics and computer algebra ..... 16 – 27 May

Workshop on air pollution modelling for environmental impact assessment ..... 16 May – 3 June

Summer School in high energy physics and cosmology ..... 13 June – 29 July

Workshop on the search for new elementary particles ..... (dates to be fixed)

Workshop on the search for new elementary particles ..... (dates to be fixed)

Research Workshop on condensed matter physics ..... 13 June – 19 August

Submicron quantum dynamics (Adriatico Research Conference) ..... 14 – 17 June

Miniworkshop on submicron quantum dynamics ..... 20 June – 1 July

Miniworkshop on quantum phase transitions ..... 4 – 29 July

Cooperative phenomena in many-electron systems and their response to external fields (Adriatico Research Conference) ..... 26 – 29 July

Miniworkshop on non-linear electromagnetic interactions in semiconductors ..... 1 – 12 August

Advanced Workshop on algebraic geometry ..... 15 – 26 August

**Conference on chemical evolution and the origin of life ..... 29 August – 2 September**

**International Workshop on parallel processing and its applications in physics, chemistry and material science ..... 5 – 23 September**

**College on medical physics: imaging, instrumentation and dose-reduction techniques ..... 12 – 30 September**

**Third College on microprocessor-based real-time control — principles and applications in physics ..... 26 September – 21 October**

**3rd Trieste Conference on recent developments in the phenomenology of particle physics ..... 3 – 7 October**

**College in biophysics: experimental and theoretical aspects of biomolecules ..... 3 – 28 October**

**Workshop on variational and local methods in the study of Hamiltonian systems ..... 10 – 28 October**

**Fourth Autumn Course on mathematical ecology ..... 24 October – 11 November**

**Suivi de l'atelier sur la préparation des plans directeurs radio-maritimes pour les pays africains francophones ..... 31 October – 11 November**

**Second Workshop on three-dimensional modelling of seismic waves generation, propagation and their inversion ..... 7 – 18 November**

**International Conference on mathematical ecology ..... 14 – 18 November**

**Experimental Workshop on high temperature superconductivity (basic activities) ..... 14 November – 2 December**

*For information and applications to courses, kindly write to the Scientific Programme Office.*

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