

News from ICTP

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Newly-elected President of Venezuela Visits ICTP

On Friday 9 November, President elect of Venezuela Carlos Andres Perez paid a short visit to the International Centre for Theoretical Physics in Trieste on his way to Saudi Arabia and Kuwait. He was welcomed at the local airport by Professor Abdus Salam, Director of the ICTP and President of the Third World Academy of Sciences, and by Italian authorities at 7.30 a.m. From 9.15 to 11.30 President Perez was at the Main Building of the ICTP where Abdus Salam and the Deputy Director of the ICTP, Professor L. Bertocchi, explained the objectives and the mode of operation of the ICTP. TWAS was illustrated by its Executive Secretary, Prof. M. Hassan, while Counsellor G. Rosso



From left to right: Professor Abdus Salam with the President of Venezuela, Sr. C.A. Perez.

Cicogna explained the last developments on the creation of the International Centre for Sciences, of which he is the Project Leader. President Perez then met scientists in residence at the ICTP, from developing countries and particularly from Latin America. He stated that Venezuela is considering with great interest initiatives like ICTP and TWAS whose aim is to reduce the technological gap between the less developed countries and the industrialized nations and that his country will strengthen its collaboration with them.

The International Centre for Science (ICS)

As announced in the issue No. 12, the feasibility study for the new International Centre for Sciences (ICS) started in July. A considerable amount of work has been done since. The ICS

should include a Centre for High Technology and Material Sciences, another for Pure and Applied Chemistry and a third for Earth and Environmental Sciences. For each of these Centres constituting ICS, many meetings and brainstorming sessions have been organized, involving first Italian experts and then scientists from advanced nations and many from developing countries. An intentional overlapping of experts attending the meetings has favoured an excellent communication between the groups. For each one of the Centres also a Steering Committee has been created, counting among its members those who have shown great interest in the new initiative and indicated their readiness to play an active role in the establishment of the future Centres and whose task is to define the pilot activities which will serve as a starting point of the future laboratories.

Each Steering Committee has prepared a first draft interim report which was subsequently enriched during the last weeks with additional input resulting from meetings, informal discussions and through correspondence. These draft interim reports were evaluated in a two-day Panel Meeting – 6 and 7 December 1988 – convened by Professor Abdus Salam, President of the Third World Academy of Sciences and Director of the International Centre for Theoretical Physics. The Panel included four Nobel Laureates – K. Siegbahn, K. Von Klitzing, K.A. Müller and Abdus Salam – in addition to other distinguished scientists. After a general presentation and introduction by Professor Abdus Salam and by Counsellor G. Rosso Cicogna, ICS Project Leader, each



From left to right: Prof. K.A. Müller, Nobel Laureate 1986, Dr. G. Rosso Cicogna, Project Leader of ICS, Professor Abdus Salam, Director of ICTP and Nobel Laureate 1979, Prof. K. Von Klitzing, Nobel Laureate 1985, and Prof. K. Siegbahn, Nobel Laureate 1981.

Centre was first presented in plenary sessions and later discussed in separate working groups where details of the scientific activity were considered. The Panel was impressed with the work done by the UNIDO Project Unit and its Committees in such a remarkably short time and agreed with the research topics indicated by the Committees as priorities as well as on the concept of pilot activities to be started in the very near future as a means of completing the definition of the long-term programmes. It commended the Government of Italy for its generous support to this initiative. The next step will consist in finalizing the Report and submitting a request for funding to the Government of Italy.

The ICTP Donation Scheme 1988

BOOK DONATION PROGRAMME

Despite cash flow difficulties at the Centre, during the year 1988, within the framework of this Programme, the

following material from ICTP was distributed among more than 500 institutions in nearly 100 developing countries:

13,200	journals
3,440	books
4,250	proceedings
1,500	newsletters and scientific journals of general interest
4,350	booklets in various languages.

In addition, during the same period, a few thousand scientific journals (all complete sets) were offered to ICTP by 33 donors in Europe and the USA and sent to 40 institutions in developing countries.

EQUIPMENT DONATION PROGRAMME

During the year 1988, within the framework of this Programme, about 50 items of scientific equipment were also distributed among 5 universities in developing countries.

Moreover, in November 1988 a group of scientists from different Third World countries visited CERN and

selected more than 100 items of equipment in various scientific disciplines for laboratories in developing countries. The actual value of this equipment can be estimated as being over US\$ 100,000.

ICTP Prizes 1990, 1991 and 1992

The International Centre for Theoretical Physics announces the institution of the following three prizes for the years 1990, 1991 and 1992.

The 1990 Prize (in honour of Professor C.V. Raman) in the fields of Solid State, Atomic and Molecular Physics;

The 1991 Prize (in honour of Professor E. Majorana) in the fields of Mathematics, Nuclear Physics, Plasma Physics and other fields of Physics;

The 1992 Prize (in honour of Professor V.F. Weisskopf) in the field of High Energy Physics.

The prizes will be awarded for outstanding and original contributions within the above fields. Candidates for the prizes must be nationals of developing countries, working and living in developing countries. Leaves of absence due to sabbaticals or studies abroad would not disqualify candidates. Each prize will consist of the sum of US\$ 1,000 payable in US dollars or in local currency.

The winner of each prize will be selected by an International Committee, from among the most outstanding scientists in the above mentioned fields.

In order to be considered for any of these prizes, a candidate must submit a review of his work and attach a brief curriculum, a list of publications and any relevant published work.

The age of the candidate must not exceed 40 years at the time the submission is made. Submissions for each prize must reach the ICTP before 30 May of the relevant year.

Submissions should be addressed to: The ICTP Prize Committee, ICTP, P.O.

Box 586, I-34100 Trieste, Italy.

Activities at ICTP in November/December

Title: FIRST AUTUMN WORKSHOP ON MATHEMATICAL ECOLOGY (31 October - 18 November 1988).

Organizers: Professors L.J. Gross (University of Tennessee, USA), T.G. Hallam (University of Tennessee, USA) and S.A. Levin (Cornell University). Computing equipment kindly made available by Olivetti S.p.A., Ivrea, Italy.

Lectures: Living with uncertainty. Plant modelling for resource management. Sentinels for distributed systems with incomplete boundary data. Applied behavioural ecology and resource management. Food webs with time dependence. Temporal variations of pelagic food webs. Mathematical modelling of the biology of the upper ocean. The dynamics of a Benthic marine population with planktonic larvae: A model based on size. Determining optimal intervention strategy for an over-utilized farming system. Equilibrium state optimization for the Noy-Meir grazing model. Pest control. Effects of plant density and soil moisture on growth indices of two upland rice varieties. The first step to a prognosis system in apple production: A mathematical model to simulate the population dynamics of the codling mathematical model to simulate the population dynamics of the codling moth (*Cydia Pomonella*). A simulation model for the management of vicuña populations. Forest management strategies refer to pine caterpillar control. Cod-capelin interactions in Icelandic waters and harvesting of both species. Optimum harvesting in an age-structured fishery model. Parameter estimation in a model for underexploited fisheries. Ratio-dependence vs. prey-dependence in predation models. Fate and transport of toxic chemicals in aquatic systems. Strategies in ecotoxicological research. Conservation genetics. Effects of toxicants on individuals in aquatic

systems. Effects of toxicants on populations in aquatic systems. Population biology and conservation of endangered primates. Population vulnerability analysis: A case study of the Concho water snake. Conservation of large-scale natural systems. A stochastic eutrophication model for Lac Lemán. The threshold between persistence and extinction of populations in a polluted environment. Modelling the energy budget of two coexisting *Daphnia* species in Lake Constance. Physiological aspects of resource-consumer toxicant systems. Estimation of faecal coliform decay rate in a tropical estuary by optimal matching. Refugium can assure yield and conservation. Plant growth models at non-standard condition. Grain storage management. Oil pollution in mangrove ecosystems. Inhibition in biofilm processes. Evolution and fluctuation in viral diseases. Models for multi-species parasite-host communities. The epidemiology of AIDS and the demographic input of disease. Optimal ages of vaccination for measles. The role of social mixing in HIV dynamics. The dynamics of interacting viral strains. Some problems of α -thalassemia related to malaria in Thailand. Ecological systems of pests infecting stored foodstuffs. Qualitative analysis of a mathematical model for tissue inflammation dynamics. Some mathematical models in typhoid fever. The temporal variability of animal populations. Dimensional reduction for epidemiological SIS models with simultaneous infection. Models of the spread of HIV infection among homosexual men in Denmark studied by simulations.

Workshop sessions: *Resource management:* Organisation; Economic, social and political concerns; Pest control issues. *Ecotoxicology:* Fate, transport, water quality; Strategies in ecotoxicological research problems; Effects. *Conservation biology:* Genetics; Problems from developing countries; Primate and large mammals; Political

problems; Problems in developing countries. Environmental problems in developing countries.

The Workshop was attended by 86 lecturers and participants (55 from developing countries).

Title: COLLEGE ON NEUROPHYSICS: "DEVELOPMENT AND ORGANIZATION OF THE BRAIN" (7 November - 2 December 1988).

Organizers: Professors A. Borsellino (International School for Advanced Studies, ISAS-SISSA, and ICTP, Trieste, Italy), O. Siddiqi (Tata Institute of Fundamental Research, Bombay, India) and J.H. Kaas (Vanderbilt University, Nashville, Tennessee, USA).

Lectures: How to read the structure of the brain in terms of function. The cerebral cortex visual and otherwise. Cortical architecture and spatial and temporal receptive field organization. Retinotopic mappings as a tool for information processing. Integration of modules for depth perception. Motion detection in man and machines. Biological strategies in robot navigation. Motion computation in flies. Computation of optical flow. 3D motion estimation. The dynamics of photoreceptors. Retina. Biological feasibility of algorithms of optical flow. Retinotopic mapping for optical flow computation. Lateral masking and computation. Lateral masking and demasking in vision. Visual reconstruction in stereo-vision. Selective attention. The organization of the premotor area. Inter-hemispheric relations. Auditory physiology and psychophysics. Impossible figures (demonstration). General introduction to the theory of "Neuronal networks". Noisy neural networks. Auditory localization. Movement computation and the aperture problem. Analysis of vertebrate retinal processing. Speech perception: spectral analysis. A solution of figure-ground discrimination problem. Strange attractors for "Neural Networks".

Speech perception: Temporal analysis. Visual strategies. Basic structure of the nervous system. Neuron structure and function. Neurotransmitters. Evolution of the neocortex. Neurotransmitter receptors. Visual system: The eye and the brain stem. The chemical senses. Somatosensory system. The development of maps of sensory surfaces in the brain. Visual cortex. The motor system. The role of neuronal death during development. Postnatal development of projections to the brain from the eye. Embryonic development of the brain in vertebrates. Cell and tissue differentiation. Rules of development deduced from directing visual projections to the auditory brain. The auditory system. Changing connections in the developing brain: The corpus callosum. Growth and trophic factors in the brain. The development of order in visual pathways. Development of the auditory system. Axon growth and pathfinding. The development of the genetically abnormal visual systems of the albino type. The role of neural activity in the development of brain maps. Information processing in the brain. Neural crest development and cell migration. Cell migration. The development of the primate visual system. Brain waves and their significance. Mathematical approaches to EEG. Neuroethology and electroreception in vertebrates. The role of neuron activity in the maintenance of organization in the mature brain. Brain plasticity, learning and memory. Taste plasticity, learning and memory. Taste reception. Development of the retina - Implications for visual function. Development of the brain - A summary and review.

Seminars: Phase-transitions in a simulation model of the network on neuron-like elements. A neural network with self-inducing noise. Cortical potentials evoked in the human brain by reversing the perceived laterality of a sound image: Stimulation by ITD-Reversals. Conformational analysis enkephalines. A high level language and micro-computer programme for description and simulation of neural

architecture. Spin glass-like neural networks. Analysis of brain electrical activity models and data processing. Scanning electron-microscope studies on the brain. Neuronetworks with dynamical thresholds. The construction and reconstruction of memory.

The College was attended by 98 lecturers and participants (64 from developing countries).

Title: WORKSHOP ON GLOBAL GEOPHYSICAL INFORMATICS WITH APPLICATIONS TO RESEARCH IN EARTHQUAKE PREDICTION AND REDUCTION OF SEISMIC RISK (15 November - 16 December 1988).

Organizers: Professors V.I. Keilis-Borok (Academy of Sciences, Moscow, USSR), L. Knopoff (University of California at Los Angeles, USA) and G.F. Panza (University of Trieste, Italy), with the co-sponsorship of the Italian Direzione Generale per la Cooperazione allo Sviluppo (Ministry of Foreign Affairs, Rome, Italy), the World Laboratory and the Consiglio Nazionale delle Ricerche (CNR, Rome, Italy). Computer equipment supplied by Olivetti S.p.A., Ivrea, Italy.

Lectures: Lithosphere as nonlinear system. Catalogues of earthquakes. The problem of earthquake prediction. Functions on an earthquake flow. Theory of dynamic systems to meteorology. Algorithm M8. Block model of seismicity. Geological contributions to long-term earthquake prediction. Construction of synthetic seismograms. Advancement in ocean circulation numerical models. Triggered earthquakes. Complexity of earthquake precursors - The dimension-reduction model for precursors. Seismic risk. Pattern recognition in earthquake prediction. A low budget study of seismicity near a natural gas field. The Messina Project. Gas and oil field seismicity. Algorithm CN. Physics vs. phenomenology. Geophysical constraints on physical models of seismicity. Laboratory

constraints on physical models. The physics of fracture. The seismological centre and data base. Crack fusion models of seismicity. Crack growth models of seismicity. Statistical verification of prediction. Dynamical systems. The structure of chaos. Statistical verification of prediction. The role of time delays in producing instability. Engineering model of seismic risk. The triangle billiard. Formal morphostructural zoning. Computer simulation of Foreschock occurrence. Lineaments, seismicity and mineral deposits. The physics of the Boolean observer. Block model of seismicity. The figure of the earth. The rotation of the earth. Moveable discs model of seismicity. Fractality of seismicity. Hierarchical model of seismicity. Systems for search of precursors. Computers and catalogues. Lithospheric properties in seismicity studies.

The Workshop was attended by 110 lecturers and participants (58 from developing countries).

Title: COLLEGE ON GLOBAL GEOMETRIC AND TOPOLOGICAL METHODS IN ANALYSIS (21 November - 16 December 1988).

Organizers: Professors S. Buoncristiano (II University of Rome, Italy), S. Gitler (University of Rochester, USA), J.D.S. Jones (University of Warwick, UK) and S.K. Donaldson (University of Warwick, UK) and S.K. Donaldson (University of Oxford, UK).

Lectures: Some background in global analysis. Introduction to differential geometry. Introduction to algebraic topology. Introduction to fibre bundles. Fibre bundles: Construction of bundles; Structures on bundles; Change of structure group. Lie groups and Lie algebras: Spin representations; Representations of SU(2). Differential geometry: The degree of a smooth map; Submanifolds; Integration on manifolds. Hodge theory. Yang-Mills equations. Dirac operators and their indices. Symplectic manifolds and geometric

quantization. Index theory. Quantum field theory and link polynomials. Yang-Mills theory and the topology of 4-manifolds. Geometry, physics and Yang-Mills theory. Yang-Mills theory, holomorphic bundles and the topology of algebraic surfaces. Floer homology and the Arnold conjecture. Yang-Mills fields geometry and physics. Compactification of algebraic homogeneous spaces and their cohomology. Morse theory (classical and Witten's approach). Kuranishi's deformation theory and applications to Calabi-Yau manifolds. Twistor theory and non-linear differential equations. Magical properties of instantons on the 4-torus. Some topological applications of harmonic mappings.

Seminars: Equivariant degree and fixed point index for self maps which "change dimension". On immersions of surfaces in 3-orbifolds. Classification of Kähler B-manifolds of constant totally real sectional curvature. Generalised Chern-Simons secondary characteristic classes and forms. Non-existence of almost complex structures on products of even-dimensional spheres. Generalised Chern-Simons secondary characteristic classes and forms. Immersions modulo bordism. A coincidence-point theorem for manifolds with boundary. Existence of holomorphic functions on twistor spaces. Totally geodesic foliations of hyperbolic manifolds. An invariant formulation of Dirac brackets. Intersection R-torsion and analytic

torsion for pseudomanifolds. On stability of Kummer surfaces' tangent bundle. Lie groups having square integrable representations and their enveloping algebras. On the differential properties of continuous functions. A new method of mechanical theorem proving. Determinants of Laplacians and isospedrality question. Riemannian manifolds with positive scalar curvature. Moduli of harmonic maps of S^2 into S^4 . Blow-up of heat flows for harmonic maps.

The College was attended by 205 lecturers and participants (134 from developing countries).



The participants in the First Autumn Workshop on Mathematical Ecology (31 October - 18 November 1988).



The participants in the College on Neurophysics: "Development and Organization of the Brain" (7 November - 2 December 1988).



The participants in the Workshop on Global Geophysical Informatics with Applications to Research in Earthquake Prediction and Reduction of Seismic Risk (15 November - 16 December 1988).



The participants in the College on Global Geometric and Topological Methods in Analysis (21 November - 16 December 1988).

Activities at ICTP in 1989

Fourth International Workshop on Computational Condensed Matter Physics: "Total Energy and Force Methods"	4 - 6 January
Workshop on Theoretical Fluid Mechanics and Applications	9 - 27 January
Course on Basic Telecommunications Science	9 January - 3 February
College on Atomic and Molecular Physics: Photon Assisted Collisions in Atoms and Molecules	7 January - 3 February
College on Theoretical and Experimental Radiopropagation Physics	30 January - 24 February
Workshop on Space Physics: Materials in Microgravity	6 - 24 February
Workshop on Remote Sensing Techniques with Applications to Agriculture, Water and Weather Resources	27 February - 17 March
Workshop on High Temperature Superconductors	27 February - 21 March
Spring School and Workshop on Superstrings	30 March - 14 April
Workshop on Radon Monitoring on Radioprotection, Environmental Radioactivity and Earth Sciences	3 - 14 April
Topical Meeting on Hyperbolic Geometry and Ergodic Theory	17 - 28 April
Spring College on Materials Science on "Ceramics and Composite Materials"	3 - 14 April
Conference on Oxygen Disorder Effects in High T_c Superconductors	17 April - 26 May
Fourth Workshop on Perspectives in Nuclear Physics at Intermediate Energies	18 - 21 April
Spring School on Plasma Physics	8 - 12 May
	15 May - 9 June

Working Party on Modelling Thermomechanical Behaviour of Materials	29 May - 16 June
Working Party on Fracture Physics	29 May - 16 June
Second ICFA School on Instrumentation in Elementary Particle Physics	12 - 23 June
Miniworkshop on "Strongly Correlated Electron Systems"	19 June - 21 July
Research Workshop in Condensed Matter, Atomic and Molecular Physics	19 June - 29 September
Interface between Quantum Field Theory and Condensed Matter Physics (Anniversary Adriatico Research Conference)	20 - 23 June
Conference on Supermembranes	26 - 30 June
Summer School in High Energy Physics and Cosmology	26 June - 18 August
Quasicrystals (Anniversary Adriatico Research Conference)	4 - 7 July
Workshop on Superstrings	12 - 14 July
Strongly Correlated Electron Systems (Anniversary Adriatico Research Conference)	18 - 21 July
Symposium on "Highlights in Condensed Matter Physics"	1 - 3 August
Workshop on Phenomenology in High Energy Physics and Cosmology	16 - 18 August
Topical Meeting on Variational Problems in Analysis	28 August - 8 September
Computations in Physics and Physics in Computation (Anniversary Adriatico Research Conference)	5 - 8 September
Adriatico Working Party on Condensed Matter Properties of Neutron Stars	11 - 29 September
Workshop on Materials Science and Physics of Nonconventional Energy Sources	11 - 29 September
Workshop on Interaction between Physics and Architecture in Environment Conscious Design	25 - 29 September
Trieste Conference on Recent Developments in Conformal Field Theories	2 - 4 October
Fifth College on Microprocessors: Technology and Applications in Physics	2 - 27 October
Workshop on Soil Physics	9 - 27 October
College on Differential Geometry	30 October - 1 December
25th Anniversary Conference on "Frontiers in Physics, High Technology and Mathematics"	31 October - 3 November
Workshop on Telematics	6 - 24 November
Course on Basic VLSI Design Techniques	6 November - 1 December
Third Autumn Workshop on "Atmospheric Radiation and Cloud Physics"	27 November - 15 December

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

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EDITORIAL NOTE - *News from ICTP* is not an official document of the International Centre for Theoretical Physics. Its purpose is to keep scientists informed on past and future activities at the Centre and initiatives in their home countries. Suggestions and criticisms should be addressed to Dr. A.M. Hamende, Scientific Information Officer.