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Prof. D. Sciama, Head of the Astrophysics Sector at the International School for Advanced Studies (SISSA), presenting the 1991 Dirac Medal to Prof. Stanley Mandelstam.

Dirac Medal Award Ceremony

On 15th June, 1992, Professor Stanley Mandelstam (University of California, Berkeley, USA) received the 1991 Dirac Medal which had been awarded to him last year. Two such medals are awarded every year on the birthday of P.A.M. Dirac — 8th August.

The ceremony took place in the Main Lecture Hall of the ICTP, Trieste. Professor Abdus Salam, Director of the ICTP and President of TWAS, was not there to preside over the ceremony as he was travelling abroad for urgent work. Prof. D. Sciama, Head of the Astrophysics Sector at the International School for Advanced Studies, chaired the function. He paid a tribute to the memory of Dirac. He was a student of P.A.M. Dirac at Cambridge University. Prof. D. Sciama presented the medal and a cheque of $5,000 to Prof. Stanley Mandelstam.

Prof. Stanley Mandelstam is honoured in recognition of his contributions to the development of theoretical physics. His representation of the analytic properties of scattering amplitudes in the form of double dispersion relations (Mandelstam representation) is basic to the modern understanding of relativistic particle scattering and his seminal work on the quantization of string theories, exploiting their conformal properties, led to a more profound understanding of this subject. Mandelstam was among the first to apply path integral quantization methods to string theory. This work was generalized and extended by many others in the following years and now forms an integral part of the modern formulations.

Prof. S. Mandelstam obtained his B.Sc. at the University of Witwatersrand (U.K.) in 1949 and his Ph.D. at the University of Birmingham (U.K.) in 1956. He started his career as a Research Assistant at the University of Birmingham (1956-57) and Boese Post-Doctoral Fellow at the Columbia University (1957-58). He then became Assistant Research Physicist at the University of California at Berkeley (1958-60). He was Professor of Mathematical Physics at the University of Birmingham (1960-63) and then in 1963 he became Professor of Physics at the University of California where he still teaches. He held the position of Visiting Professor at the Universities of Harvard (1966) and Paris Sud (1979-80,

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1984-85). He is a Fellow of the Royal Society of London, the American Physical Society and the American Academy of Arts and Sciences. This year he has received the Dannie Heinemann Prize. ♦

Interview with Prof. S. Mandelstam

ICTP Dirac Medal

Professor Stanley Mandelstam's interview was taken by Dr. A.M. Hamende, former Scientific Information Officer of ICTP and presently consultant of TWAS.

Q.: Professor Mandelstam, thirty years ago you lectured in a seminar, in Trieste, which was a prelude to the future International Centre for Theoretical Physics created by Abdus Salam two years later. Today, you are honoured with the Dirac Medal of the ICTP. What are your impressions?

A.: I am most impressed with the way in which the conception of Abdus Salam has materialized. From the 1962 Seminar there grew the institute we have today, whose activities cover all aspects of theoretical physics and some related areas, and which is a most important scientific institution for the developing countries. Needless to say, I feel extremely honoured to have received the Dirac Medal from the ICTP.

Q.: The 1962 Seminar is still remembered in Trieste as a most fascinating meeting because of the quality of the lectures and of the participants. Schwinger, Wigner, Abdus Salam, Regge and yourself were there. Everyone worked very hard and the atmosphere was really exceptional. Do you remember anything special in this connection?

A.: I was only at the Seminar for about a week, but I remember it well. I fully agree with your description and found the seminar to be extremely stimulating.

Q.: In thirty years, theoretical physics has made tremendous progress. Could you please outline in simple words, if this is possible, the development of your own thinking, starting from the Mandelstam representation to today's string theories?

A.: Thirty years ago, we hoped that the general principles of quantum mechanics and relativity might go a long way towards providing a theory, rather than simply a framework of a theory, of elementary particles. It now appears that we were too naïve; the idea may still be correct, but it could not be put into practice with our knowledge at that time. Most of the remarkable developments in particle theory during the seventies depended on the choice of a specific Lagrangian, i.e. of further detailed input besides the above-mentioned general principles. Nevertheless, the work performed during the earlier period did lead to string theories, which, in turn, not only led to modern string theories, but also greatly influenced the gauge theories of the seventies, in particular with the concept of confined flux tubes. I feel that modern string theories now offer the best hope of increasing our fundamental knowledge of elementary particles, though I never thought they were a "theory of everything". A conceptual increase in our knowledge is probably necessary before we have a consistent string theory; at this time we only have a perturbative approximation of such a theory.

Q.: What are the great challenges in front of the theorists today? What is your advice to young students wishing to work in theoretical physics?

A.: One obvious challenge is to unify the different parts of the present "standard model" into a simple theory. I think most people would now agree that current "Grand Unification" theories, while certainly an important step forward, are not the final answer, and that the sought-for unification should include gravity. Constructing a quantum theory of gravity may itself require a conceptual advance, as I indicated in my reply to your previous question. Another problem, perhaps less glamourous but nevertheless extremely important, is to obtain better methods of solving the strong interaction problem for ordinary field theories (as opposed to string theories); if we expect eventually to be able to calculate with future theories, whatever they may be, we must be able to do so, in as efficient a way as possible, with our present theories.

A third challenging problem, I need hardly say, is to suggest and interpret experiments on new and future accelerators, in order to shed light on the many unknown features of the standard model. Astrophysical and cosmological aspects of elementary-particle theories; in particular, the nature of dark matter, provide further challenging problems.

In reply to the last part of your question, I have regretfully to add that the necessity of finding a job is something that even good students have to consider very carefully, and that the best choice of a research problem from this point of view may not necessarily be the one which the student finds most interesting or important. ♦

ICTP Associate Receives Iranian Award

The first Prize for the Fifth Khowarazmi Scientific Festival, organised by the Iranian Research Organisation for Science and Technology, has been awarded to Dr. Quaiser Mushtaq of Mathematics Department, Quaid-i-Azam University, Islamabad. Dr. Qaiser Mushtaq is an Associate Member of the International Centre for Theoretical Physics (ICTP.

The Pakistan Academy of Sciences was asked to nominate scientists for this Prize and recommended half a dozen nominees. This festival is annually held to commemorate Mohammad bin Mousa Khowarazmi, the Iranian mathematician and astronomer, for honouring the distinguished scholars of the region.

Innovative research projects in the distinguished scholars of the region.

Innovative research projects in the fields of engineering, agriculture, basic sciences, medical sciences humanities are evaluated and prizes are awarded to those adjudged the best.

Dr. Qaiser Mushtaq is presently an Associate Professor of Mathematics at Quaid-i-Azam University, Islamabad. He has made significantcontributions to mathematics in the field of group theory. ♦

"News from ICTP" would welcome reports or science articles from other Associate Members or participants from developing countries who visited ICTP.

Pope John Paul II Meets Scientists of Trieste

While on a three-day visit to several cities of the Friuli-Venezia-Giulia Region, His Holiness, Pope John Paul II met the scientific community of Trieste at the University on Saturday, 2nd May, 1992. A long applause greeted the Pope when he entered the Aula Magna of the University at 8.45 a.m., accompanied by Mons. Bellomi, Bishop of Trieste, and by the Rector of the Trieste University, Professor G. Borruso. When he reached the auditorium, John Paul II greeted by Professor Abdus Salam, exchanged a few words with him and was given a copy of the Holy Quran.

Professor Abdus Salam welcoming His Holiness Pope John Paul II on the occasion of the Holy Father's visit to Trieste's scientific community.

Welcoming His Holiness in the Trieste world of culture and of science, the Rector of the University stressed the existing collaboration of the Trieste scientific institutions with Eastern Europe and with the developing countries, which contributes to a better understanding and enhanced solidarity between people of different cultures.

Professor Abdus Salam delivered the keynote address on behalf of the international scientific community of Trieste. He said, *"I am glad at the invitation to speak before His Holiness, John Paul II, today. His is an example of the charitable feelings which are beginning to produce a different atmosphere between the Catholic Christians and the Muslims and His Holiness is directly responsible for this"*. After having drawn a similarity between the catholic and muslim religions, Prof. Abdus Salam recalled the courage of John Paul II when he declared in 1983, at a special ceremony at the Vatican: *"The Church's experience, during the Galileo affair and after it, has led to a more mature attitude. The Church herself learns by experience and reflection and she now understands better the meaning that must be given to freedom of research. It is through research that man attains to Truth. ... This is why the Church is convinced that there can be no real contradiction between science and faith. ... (However), it is only through humble and assiduous study that (the Church) learns to dissociate the essential of the faith from the scientific systems of a given age, specially when a culturally-influenced reading of the Bible seemed to be linked to an obligatory cosmology"*.

Professor Abdus Salam illustrated the international scientific initiatives which bloomed in Trieste since 1964: the International Centre for Theoretical Physics (ICTP), the International Centre for Genetic Engineering and Biotechnology (ICGEB), the Synchrotron Light Radiation Laboratory, the International Centre for Science and High Technology (ICS), the Research Area and the Third World Academy of Sciences (TWAS). He recalled that it was the Pontifical Academy which had inspired him to create the TWAS when, nine years ago and for the first time as a Fellow, he attended a meeting of this prestigious Academy. A warm invitation of His Holiness to honour with his presence the 1994 TWAS General Conference at Tehran concluded the address of Professor Abdus Salam.

The Pope said in his address, *"Science has changed the world of men, but much has still to be done. Now there are no more divergencies between the Catholic Church and scientific research. The conflicts of the past, in particular those related to the natural science, have been overcome. Therefore, collaboration is possible for arriving at common ends. Some limits still remain, however, the more obscure one being death"*. John Paul II also drew the attention to the responsibility of scientists when their work is used for fabricating deadly weapons and concluded: *"This Region is stimulated by nature and invited by history to act as a link between peoples, migration fluxes and different cultural heritages"*. This was the first time in nearly two thousand years that a pope came to the city of Trieste. ♦

Conferences and Lectures

Prof. G. Baskaran, of the ICTP Condensed Matter Research Group, was invited to give a talk on electron correlations and superconductivity in fullerenes, and to be a member of the Panel Discussion on "Mechanisms of High T_c Superconductivity" at the Conference on High Temperature Superconductivity from 11 to 13 May 1992 in Capri, Naples, Italy. ♦

International Centre of Condensed Matter Physics

The International Centre of Condensed Matter Physics (ICCMP) of the University of Brasilia is an institute for theoretical research, appropriately set up to hold scientific events on frontier topics of condensed matter physics. The ICCMP annual programme is planned one year in advance by a Scientific Committee. The Committee is presently under the chairmanship of G.D. Mahan.

ICCMP operates as an attraction pole for visiting researchers from all over Latin America and the world.

Research lines

There are three research groups at ICCMP. There are, at present, six staff members and about ten MSc and PhD students engaged in research activities. Our main areas of interest are:

1. strongly correlated systems: high T_c superconductivity, magnetism in metals, electron crystallization, metal-insulator transition in light elements under extreme conditions (metallic hydrogen, carbon, etc.), electron interaction in polymers, doped semiconductors.
2. disordered systems: Anderson localization in amorphous metals and semiconductors, electron transport in liquid metals, electronic structure of glassy materials, and phase diagrams of semiconductor alloys.
3. condensed matter field theories: gauge theory of topological defects, theory of melting, solid-liquid interfaces, quantum Hall effect, anyons and fractional charges in superconductivity, supersymmetry of elementary excitations.

Programmes

ICCMP annual academic activities consist mainly of workshops, winter schools and topical conferences. Funds are available to cover travel and living expenses of a limited number of participants. There are a number of visiting professors and postdoctoral fellowships. The recipients of these fellowships will be able to develop research work in Brasilia for periods ranging from six months to two years.

Local support

ICCMP has a strong financial support from the Brazilian Government through the agencies Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Financiadora de Estúdios e Projetos (FinEP), Secretaria de Ciencia e Tecnologia (SCT), Fundaçao Banco de Brasil (FBB) and others. To carry out academic events, ICCMP also relies on the financial support from IBM do Brasil.

Scientific meetings to be held in 1992:

Winter School on mesoscopic systems (6-17 July), director: K.-A. Chao (Norway);
Conference on non-linear optics (October), director: C.B. de Araujo (Brazil).

Scientific meetings to be held in 1993:

Jorge A. Swieca School: statistical mechanics (January), director: S. Goulart Rosa (Brazil);
Conference on organic superconductors (April), director: M. Schluter (USA);
Winter School on field theory (July), director: to be confirmed;
Conference on thin films (October), director: S. Rezende (Brazil).

Mailing address:

International Centre of Condensed Matter Physics
caixa postal 04667
70919 Brasilia - DF
Brazil
fax/phone: 55 (61) 273-3884
bitnet: ICCMP@brunb.bitnet ♦

Cooperation Programme of the European Community with Central and East European Countries

This new programme of co-operation of EC has now been announced with a budget of 55 million Ecus. The countries to be benefitted are: Albania, Bulgaria, the Czech and Slovak Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania.

The following aspects concern mathematicians:

(A) *Mobility*

"Go West" Fellowships
(duration 3 months)

Under the scheme, a Central or East European scientist visits the receiving institution in the West. The applications should contain both the nominating and the receiving (nominated) institutions.

"Go East" Fellowships
(duration 1 to 3 months)

Researchers from the West will spend 1-3 months in Central or East European countries to participate in research activities or to help to develop new directions in research.

(B1) *Scientific networks*

Such a network should involve at least 2 E.C. and 2 "Eastern" teams.

(B2) *Participation at conferences*

It is to be encouraged to help promote collaboration throughout Europe.

(C) *Joint research projects with industry*

Among the accepted themes, information and communication technology is probably the only one connected with mathematics.

(D) *Support for participation in E.C. Programmes*

In particular, this should ensure participation of Central and East European scientists in the Human Capital and Mobility Programme mentioned above.

For all information, one can contact: E.C. Commission, Scientific Cooperation with Central and Eastern Europe, 75 rue Montoyer, 1040 Brussels, Belgium, Fax (32) 2-2363308. ♦

"Primo Rovis" International Prize 1992

The awarding ceremony of the International "Primo Rovis" Prize 1992 to ECSITE (Paris, France) took place at the end of May, in the headquarters of the Italian national association of industrialists in Rome-EUR, and in the presence of the Minister of University and Scientific and Technological Research, Mr. Antonio Ruberti, during the "Telesio" exhibition of audiovisual products and multimedial supports for scientific culture and training which marked the end of the "Second Week of Scientific and Technological Culture". The Prize was handed to Prof. Roger Lesgards, Chairman of the Consortium and of the Cité des Sciences et de l'Industrie of Paris, who took it on behalf of ECSITE.

The Prize Committee — presided over by the Nobel Laureate Prof. Abdus Salam — assigned the Prize, in the field of multimedial scientific didactics, to ECSITE for the following reason: *"The Consortium of European museums and scientific centres fosters the interest of a very large public, students in particular, in scientific methodology, exploration of natural phenomena through experimentation, knowledge of technology and insight in cultural reasons underlying scientific activites. ECSITE has devoted itself to the transfer of didactic methods for the benefit of a pan-European development of scientific culture through media, by pursuing a successful cultural policy aimed at increasing scientific and technological knowledge in schools, thereby determinating new teaching projects"*.

Indeed, the Consortium of European museums and scientific centres makes TV programs, issues specialized journals and has computerized networks, thereby pursuing a policy aimed at increasing the dissemination of scientific methods and knowledge of technology in schools. Particularly interesting were the itinerating exhibitions on sports, environment and key-experiments in the history of physics, open to the European public, which were devised and produced jointly by all the members of the Consortium.

The Prize, worth $ 20,000, was instituted thanks to the generosity of the businessman Comm. Primo Rovis from Trieste, who has been a promoter and supporter of several humanitarian, social and cultural initiatives aimed at the improvement of society. This Prize makes visible the role played by the city of Trieste in Italy and Europe in the field of scientific culture.

This edition of the Prize has confirmed the prestigious and highly cultural presence on the international scene of the scientific initiatives in Trieste and of its promoter, to the same extent as the previous editions which received wide press coverage both at the national and international level. ____ ♦

Wave Function Collapse Phenomenon in Atomic Physics

S.N. Tiwary
Associate, ICTP

1. Introduction

There has been growing interest in the collapse of wave functions [1–10] in atomic physics. It was pointed out by Griffin *et al.* following the pioneering work of Goepert-Mayer that solutions of the radial Schroedinger equation in a double-valley potential tend to transfer suddenly between the outer and inner potential tend to transfer suddenly between the outer and inner well (wave function collapse or orbital collapse) for relatively small changes in the height of the centrifugal potential barrier separating the two valleys. The collapse of the orbitals play an extremely important role in the accurate calculations of the oscillator strengths.

Knowledge of both the length (f_L) and velocity (f_V) forms of the optical oscillator strengths is needed in astrophysics, plasma physics, atmospheric physics, laser physics, fusion research and space research; it is also required in testing the accuracy of the wave functions involved in the transitions under consideration. The agreement between f_L and f_V indicates the accuracy of the wave functions. Accurate wave functions are needed for the reliable study of collision processes in atoms, molecules and ions.

There has been growing interest in the inner-shell excitation of atoms and ions from both experimentalists and theorists, because inner-shell excitation, in general, leads to autoionization which plays a very important role in explaining the structure observed in the total ionization cross section curve for electron impact.

Consequently, much of current theoretical as well as experimental work is devoted to evaluate the accurate oscillator strengths of the inner-shell excitation process in atoms and ions. strengths of the inner-shell excitation process in atoms and ions. From a theoretical point of view, accurate oscillator strengths can be expected only if accurate wave functions are employed in the transition matrix elements. If the wave functions are exact, the length and velocity forms of the oscillator strengths (f_L and f_V) will be equal. In general, the correct description of a transition depends on (a) the form of the dipole operator (b) correlations and (c) choice of basis orbitals used in the configuration-interaction calculations.

Very recently, Tayal and Henry [11] have calculated the configuration-interaction (CI) oscillator strengths for the resonance transition in the Fe^{15+} ion of the sodium isoelectronic sequence in the LS coupling scheme. They have not included the relativistic effects which may introduce some errors in their theoretical results. It is well known that the relativistic effects play an extremely important role in obtaining accurate results especially in heavy ions. Consequently, it is indispensable to incorporate the relativistic effects in order to obtain reliable re-

sults. Tiwary *et al.* [12] have investigated the length and velocity forms of the oscillator strengths using Hartree-Fock and large configuration-interaction wave functions for the inner-shell excitation of the P^{4+} ion but the agreement between the CI f_L and f_V is poor.

Our purpose in this communication is to examine the effects of (1) relativity, (2) correlations and (3) inclusion of 3p and 3d orbitals, which satisfy the condition $< r >_{2p} \approx < r >_{3p} \approx < r >_{3d}$ (this means the collapse of 3p and 3d electrons wave functions), taken from Clementi and Roetti [13] (smaller exponents of 2p orbital of Clementi and Roetti are used for 3p and 3d orbitals) in our present CI calculations on both the length and velocity forms of the optical oscillator strengths for the inner-shell excitation, which leads to autoionization and plays an important role in explaining the structure observed in the total ionization cross sections curve by electron impact, $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow 1s^2 2s^2 2p^5 3s^2\ ^2P^o_{J'}$ transition in Na, Mg^+, Al^{2+}, Si^{3+}, P^{4+}, S^{5+}, Cl^{6+}, Ar^{7+}, K^{8+}, Ca^{9+}, Sc^{10+}, Ti^{11+}, Fe^{15+}, Cu^{18+}, Zn^{19+}, Br^{24+} and Kr^{25+} ions of the sodium isoelectronic sequence.

2. Method

We have performed our J-independent and -dependent calculations using the general configuration-interaction (CI) code CIV3 of Hibbert [14] and Glass and Hibbert [15]. The LS wave functions are written in the form

$$\Psi(LS) = \sum_{i=1}^{M} a_i \Phi_i(\alpha_i LS) \qquad (1)$$

The coefficients a_i are the eigenvectors components of the Hamiltonian matrix with typical element

$$H_{ij} = < \Phi_i | H | \Phi_j > \qquad (2)$$

Φ_j are single-configuration functions constructed from one-electron functions, whose orbital and spin momenta are coupled to form the common total angularmomentum quantum numbers L and S according to a prescription denoted in (1) by α_i.

We express the radial parts of the one-electron functions in analytical form as a sum of Slater-type orbitals, following Clementi and Roetti [13]:

$$P_{nl} = \sum_{j=1}^{k} C_{jnl} r^{I_{jnl}} e^{-\xi_{jnl} r} \qquad (3)$$

The parameters in (3) can be varied to optimize the energy of any state, subject to the orthonormality conditions

$$\int_0^\infty P_{nl}(r) P_{n'l}(r)\, dr = \delta_{nn'} \qquad (4)$$

Once the radial wave functions are determined, relativistic effects may be added to the Hamiltonian in the form of the Breit-Pauli interaction, of which we include the spin-orbit, spin-other-spin, spin-spin, mass correction, and one-body Darwin terms. The first three terms split LS states into J-dependent levels while the last two affect the overall energy of each term.

The expansion (1) is then replaced by

$$\Psi(J) = \sum_i a_i \Phi_i(LSJ) \qquad (5)$$

where the summation now includes single-configuration with different L and S (which can couple to form a common J value).

The matrix which is diagonalized to give the eigenenergies and eigenvectors components a_i now contain the Breit-Pauli operators as well as the previous non-relativistic terms in the Hamiltonian. The parameters for the basis orbitals used in the present calculation chosen on the criterion $< r_{2p} > \approx < r_{3p} > \approx < r_{3d} >$ are shown in Table 1, and the configurations and their weights are given in Table 2 for the Fe^{15+} ion of the sodium isoelectronic sequence.

Table 1

Parameters for the bound orbitals used in the present calculation. Each orbital is a sum of Slater-type orbitals

Orbital	Coefficient	Power of r	Exponent
1s	107.906937	1	15.3583002
	4.9286451	1	24.2626038
	0.4062686	2	5.6978903
	82.4930267	2	13.8613005
	0.0015250	3	2.3205605
	-0.1374697	3	4.7854404
2s	107.906937	1	15.3583002
	4.9286451	1	24.2626038
	0.4062686	2	5.6978903
	82.4930267	2	13.8613005
	0.0015250	3	2.3205605
	-0.1374697	3	4.7854404
3s	107.906937	1	15.3583002
	4.9286451	1	24.2626038
	0.4062686	2	5.6978903
	82.4930267	2	13.8613005
	0.0015250	3	2.3205605
	-0.1374697	3	4.7854404
2p	31.1924896	2	4.3621998
	57.1310425	2	7.3200998
	17.4756317	2	13.3274002
3p	185.6664580	2	4.3621998
	-1805.6042500	3	7.3200998
3d	447.4538570	3	4.3621998

Table 2

Configurations used for the excited $^2P^o$ state in the present calculation. The numbers below the configurations give their weights

$^2P^o$	$2p^5 3p^2(^3P)$	$2p^5 3p^2(^1D)$	$2p^5 3s^2$	$2p^5 3s(^3P)3d$	$2p^5 3s(^1P)3d$
$2p^5 3s^2$	0.00000121	-0.00000252	-0.99995983	-0.00701480	0.00546599
$2p^5 3s(^1P)3d$	0.00070344	-0.00100292	-0.00825809	0.50439984	-0.86342931
$2p^5 3s(^3P)3d$	-0.00190255	0.00294591	-0.00329976	0.86343771	0.50443131
$2p^5 3p^2(^3P)$	0.79760921	0.60317397	-0.00000003	-0.00020427	-0.00016460
$2p^5 3p^2(^1D)$	0.60317057	-0.79760313	0.00000134	0.00240037	0.00282430

Table 3

J-independent and -dependent oscillator strengths of $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow 1s^2 2s^2 2p^5 3s^2\ ^2P^o_{J'}$ in Fe^{15+}

	present results		other results		present results			
function	f_L	f_V	f_L	f_V	$2J+1$	$2J'+1$	f_L	f_V
H	0.064	0.060			2	2	0.022	0.019
					2	4	0.043	0.040
CI	0.084	0.087	0.087	0.084	2	2	0.031	0.028
					2	4	0.059	0.056

3. Results and discussion

Table 3 displays the J-independent and -dependent Hartree-Fock(HF) and configuration-interaction (CI) optical oscillator strengths, of both length (f_L) and velocity (f_V), of the resonance excitation (the inner-shell excitation which leads to autoionization) $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow 1s^2 2s^2 2p^5 3s^2\ ^2P^o_{J'}$ transition in the Fe^{15+} ion of the sodium isoelctronic sequence along with the other available theoretical results of Tayal and Henry [11].

Several features of importance emerge from Table 3. First, relativistic effects lead to an increase of f_L values in both the HF and CI calculations whereas the situation is reverse in the case of the f_V values. Second, correlations effects enhance both f_L and f_V values which agree with the prediction of Tayal and Henry. Our present CI f_L is smaller than the CI f_V which disagrees with the prediction of Tayal and Henry. It is interesting to note that our CI f_L and f_V are exactly the same as that of Tayal and Henry CI f_V and f_L. We have exactly used the same set of configurations and orbitals. This may be probably due to different choices of 3p and 3d orbitals. Our 3p and 3d orbitals are taken from Clementi and Roetti [13] whereas Tayal and Henry have obtained by optimization. From the computational point of view, our present approach is much more economic than the Tayal and Henry approach, because we do not need to generate even the excited orbitals. Third, it is clear from Table 3 that the relativistic f_L and f_V values for the $\Delta J = 0$ transition significantly smaller compare to the f_L and f_V values for the $\Delta J = 1$ transition. Finally, our present results clearly demonstrate that the correlations have substantially larger influence than the relativity on the oscillator strengths, of both the length and velocity forms, of the inner-shell excitation, which leads to autoionization, in the Fe^{15+} ion of the sodium isoelectronic sequence. However, the effect of relativity is not negligible. This suggests that it is indispensable to incorporate the relativistic and correlations effects simultaneously in order to obtain the most reliable results.

Table 4 displays the present theoretical inner-shell excitation energies and oscillator strengths calculated using HF and small CI wave functions for the transition $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow$ energies and oscillator strengths calculated using HF and small CI wave functions for the transition $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow$ $1s^2 2s^2 2p^5 3s^2\ ^2P^o_{J'}$ in Na, Mg^+, Al^{2+}, Si^{3+}, P^{4+}, S^{5+}, Cl^{6+}, Ar^{7+}, K^{8+}, Ca^{9+}, Sc^{10+}, Ti^{11+}, Fe^{15+}, Cu^{18+}, Zn^{19+}, Br^{24+} and Kr^{25+} ions of the sodium isoelectronic sequence obtained employing our present new strategy for the CI calculations. We notice that (i) the oscillator strengths increase with increase of atomic number (Z) up to S^{5+} ion and then decrease systematically, (ii) the correlation enhances the values of the oscillator strengths and (iii) the disagreement between the length and velocity forms of the oscillator strengths reduces with increase of Z for lowly ionized atoms and the situation is reverse for highly ionized atoms. This is probably due to the fact that the effect of relativity is not important for lowly ionized atoms, only correlation plays an important role whereas for highly ionized atoms, the effect of relativity is more important than the effect of the correlation.

Table 5 shows the relativistic optical oscillator strengths (OOS) for the above mentioned transition and systems. It is

clear from Table 5 that the effect of relativity increases with increase of atomic number (Z). In order to see the general trend of the relativistic and non-relativistic oscillator strengths of the inner-shell excitation transition in the sodium isoelectronic sequence, we have plotted the f-value versus 1/Z as shown in Figure 1.

It is clear from Figure 1 that the trend of the oscillator strengths is regular and systematic.

4. Conclusion

Our present theoretical relativistic and non-relativistic investigations of both the length and velocity forms of the optical oscillator strengths demonstrate the importance of correlations, relativity and wave function collapse phenomenon in configura-tion-interaction calculations in the sodium isoelectronic sequence. We hope that this work will stimultate experimental and other elaborate theoretical investigations.

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Table 4

Oscillator strengths of the lowest-lying autoionizing level in Na iso-electronic sequence

	HF			CI		
$2p^6 3s^2 Se \rightarrow 2p^5 3s^2 2p0$	ΔE	f_L	f_V	ΔE	f_L	f_V
Na	1.266	0.044	0.033	1.266	0.047	0.039
Mg^+	1.965	0.065	0.053	1.965	0.073	0.068
Al^{2+}	2.814	0.073	0.062	2.814	0.085	0.083
Si^{3+}	3.804	0.076	0.066	3.804	0.090	0.090
P^{4+}	4.936	0.076	0.068	4.936	0.083	0.083
S^{5+}	6.208	0.076	0.068	6.208	0.094	0.095
Cl^{6+}	7.619	0.075	0.068	7.619	0.094	0.096
Ar^{7+}	9.171	0.074	0.067	9.170	0.093	0.095
K^{8+}	10.862	0.072	0.066	10.860	0.092	0.094
Ca^{9+}	12.692	0.071	0.065	12.692	0.091	0.093
Sc^{10+}	14.661	0.067	0.064	14.660	0.089	0.092
Ti^{11+}	16.769	0.069	0.063	16.768	0.088	0.091
Fe^{15+}	26.594	0.064	0.060	26.593	0.084	0.087
Cu^{18+}	35.422	0.062	0.058	35.419	0.080	0.082
Cu^{18+}	35.422	0.062	0.058	35.419	0.080	0.082
Zn^{19+}	38.641	0.061	0.058	38.640	0.079	0.081
Br^{24+}	56.831	0.058	0.055	56.826	0.074	0.076
Kr^{25+}	60.885	0.057	0.055	60.882	0.073	0.076

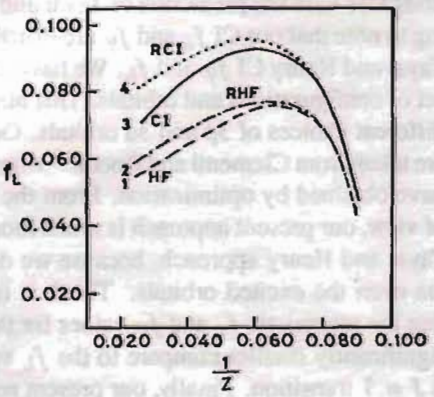

Figure 1. *Theoretical oscillator strengths (f_L) as a function of 1/Z for the resonance excitation $1s^2 2s^2 2p^6 3s\ ^2S^e_J \rightarrow 1s^2 2s^2\ 2p^5 3s^2\ ^2P^o_J$, transition in Na, Mg^+, Al^{2+}, Si^{3+}, P^{4+}, S^{5+}, Cl^{6+}, Ar^{7+}, K^{8+}, Ca^{9+}, Sc^{10+}, Ti^{11+}, Fe^{15+}, Cu^{18+}, Zn^{19+}, Br^{24+} and Kr^{25+} ions of the sodium isoelectronic sequence.*
Curve 1, Hartree-Fock (HF);
Curve 2, Relativistic Hartree-Fock (RHF);
Curve 3, Configuration-interaction (CI);
Curve 4, Relativistic configuration-interaction (RCI).

Table 5 Relativistic OOS.

	HF			CI		
$2p^6 3s^2 Se \rightarrow 2p^5 3s^2 2p0$	ΔE	f_L	f_V	ΔE	f_L	f_V
$J = 0.5 \rightarrow 0.5$	1.273	0.015	0.011	1.273	0.015	0.013
Na						
$J = 0.5 \rightarrow 1.5$	1.268	0.029	0.022	1.268	0.031	0.026
M_g^+	1.976	0.022	0.018	1.976	0.024	0.023
	1.967	0.044	0.035	1.967	0.049	0.045
Al^{2+}	2.829	0.025	0.021	2.829	0.028	0.027
	2.815	0.049	0.045	2.814	0.057	0.055
Si^{3+}	3.827	0.026	0.022	3.825	0.030	0.030
	3.806	0.051	0.044	3.804	0.061	0.060
P^{4+}	4.967	0.026	0.023	4.967	0.028	0.027
	4.937	0.051	0.045	4.937	0.056	0.055
S^{5+}	6.251	0.026	0.023	6.251	0.03	0.032
	6.208	0.051	0.045	6.208	0.063	0.063
Cl^{6+}	7.676	0.025	0.022	7.676	0.032	0.032
	7.619	0.050	0.045	7.619	0.063	0.064
Ar^{7+}	9.245	0.025	0.022	9.245	0.032	0.031
	9.169	0.049	0.045	9.168	0.063	0.063
K^{8+}	10.957	0.024	0.022	10.956	0.032	0.031
	10.857	0.048	0.044	10.856	0.063	0.063
Ca^{9+}	12.813	0.024	0.023	12.813	0.032	0.031
	12.686	0.048	0.043	12.686	0.063	0.062
Sc^{10+}	14.812	0.024	0.021	14.814	0.031	0.030
	14.651	0.047	0.043	14.652	0.062	0.061
Ti^{11+}	16.656	0.023	0.021	16.959	0.031	0.028
	16.755	0.046	0.042	16.758	0.061	0.059
Fe^{15+}	26.989	0.022	0.019	27.010	0.031	0.028
	26.551	0.043	0.040	26.572	0.069	0.056
Cu^{18+}	36.065	0.021	0.019	36.115	0.029	0.026
	35.344	0.041	0.039	35.396	0.067	0.053
Zn^{19+}	39.387	0.021	0.019	39.450	0.029	0.026
	38.547	0.041	0.038	38.612	0.057	0.052
Br^{24+}	58.290	0.019	0.018	58.507	0.029	0.024
	56.618	0.039	0.037	56.838	0.055	0.047
Kr^{25+}	62.535	0.019	0.018	62.813	0.028	0.023
	60.640	0.038	0.037	60.918	0.054	0.046

Francis Harry Compton Crick (UK), 1962
"for the discoveries concerning the molecular structure of nuclear acids and its significance for information transfer in living material".
Date of visit:
1968, June 9 – 13.

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. More will be published in future ICTP newsletters.

Leon N. Cooper (USA), 1972
"for the theory of superconductivity called the BCS theory".
Date of visit:
1968, June 8 – 28.

Aage Niels Bohr (Denmark), 1975
"for the discovery of the connection between collective motion and particle motion in the atomic nucleus and for the development of the theory of the structure of the nucleus based on this connection".
Date of visit:
1968, June 9 – 17.

Philip Warren Anderson (USA), 1977
"for fundamental investigations of the electronic structure of magnetic and disordered systems".
Dates of visits:
1968, June 6 – 14
1969, November 3 – 5
1981, September 28 – 30
1983, June 30 – July 2
1990, August 11 – 13.

Hans Albrecht Bethe (USA), 1967
"for his contributions to the theory of nuclear reactions, especially for his discoveries concerning energy production in stars".
Dates of visits:
1968, June 11 – 14
1970, March 19 – 28
1974, March 25 – 29.

Statistical Data on Activities at ICTP in 1991

The following tables deal with all activities combined, therefore they show the *actual* number of visitors, i.e. those scientists who participated in more than one activity are counted only once.

Summary of Participation
1991 vs. 1990

	Visitors		Person/Months		Total		Percentage (Dev. vs. total)	
	Dev.	Adv.	Dev.	Adv.	Visitors	P/M	Visitors	P/M
1991	2066	1918	3162.77	1059.11	3984	4221.88	51.86	74.91
1990	2407	1525	3509.13	844.10	3932	4353.23	61.22	80.61
1991 vs. 1990 Increase/ Decrease	-16.51%	+25.77%	-10.95%	+25.47%	+1.32%	-3.11%		
The above figures for **1991** include:								
Outside activities	124	3	724.10	1.41	127	725.51	97.64	99.81
Co-sponsored activities	23	112	19.64	56.25	135	75.89	17.04	82.96
The above figures for **1990** include:								
Outside activities (Training in Italian Laboratories)	120	-	688.19	-	120	688.19	100.00%	100.00%

Participation by geographical areas
in the research and training-for-research activities
of the ICTP in 1991

Geographical area	Visitors		Person/months		Total for Area	
	Dev.	Adv.	Dev.	Adv.	Visitors	P/months
Africa	261	1	420.50	2.01	262	422.51
Asia	843	65	1491.85	60.61	908	1552.46
Europe	521	1497	626.39	712.43	2018	1338.82
Indonesia and Oceania	9	8	7.43	8.00	17	15.43
North and Central America	98	284	129.79	196.13	382	325.92
South America	334	-	486.81	-	334	486.81
International Organizations	-	63	-	79.93	63	79.93
TOTAL	**2066**	**1918**	**3162.77**	**1059.11**	**3984**	**4221.88**
% Developing vs. Total					**51.86**	**74.91**

Breakdown of the number of scientists who worked at the ICTP in 1991 and of person/months by scientific field

Other tables show that the total number of scientists who came to the ICTP is 3984 while the total number of person/months is 4221.88. In the tables which follow the number of scientists will be higher since several of them took part in more than one activity.

Table 1 shows a summary of the breakdown while Table 2 shows the details. Percentages refer to the total participation in the field vs. the grand total.

Table 1
Breakdown by field of activity

Activity	Number of Visits				Number of Person/months			
	Dev.	Adv.	Total	%	Dev.	Adv.	Total	%
1. Fundamental Physics	396	459	855	18.45	491.84	315.30	807.14	19.12
2. Condensed Matter	810	604	1414	30.51	792.77	252.73	1045.50	24.76
3. Mathematics	377	263	640	13.81	502.62	178.51	681.13	16.13
4. Physics & Energy	127	127	254	5.48	122.87	39.55	162.42	3.85
5. Physics & Envir.	218	200	418	9.02	108.55	64.84	173.39	4.11
6. Applied Physics	279	159	438	9.46	281.66	92.10	373.76	8.85
7. Adriatico Conferences	74	137	211	4.55	12.80	23.34	36.14	0.86
8. Other research	96	46	142	3.06	105.92	35.08	141.00	3.34
Total	2377	1995	4372	94.34	2419.03	1001.45	3420.48	81.02
Outside activities	124	3	127	2.74	724.10	1.41	725.51	17.18
Co-sponsored activities	23	112	135	2.91	19.64	56.25	75.89	1.80
GRAND TOTAL	**2524**	**2110**	**4634**		**3162.77**	**1059.11**	**4221.88**	

Hosted activities

Hosted activities

1.	Theoretical course on bacterial genetics	18 –22 March
2.	Task Group Meeting on probabilistic exposures	3–5 April
3.	International School of medical genetics	21–27 April
4.	Algoritmi, modelli di calcolo e strutture informative	2–4 May
5.	Fifth Session of the Editorial Board for the IBCM	25–27 June
6.	Meeting on physiological correlates of mentally represented actions	23–27 September
7.	TWAS Council Meeting and TWNSO Executive Board Meeting	3–4 October
8.	Galaxy environments and the large–scale structure of the universe	22–26 October
9.	Workshop on composite materials	28 October–8 Nov
10.	Interim Executive Committee of TWOWS	2–3 December
11.	International Conference "From molecular dynamics to combustion chemistry".	16–21 December

Table 2 shows a statistical summary of the activities at the ICTP itself and outside its premises.

Table 2
Statistical Summary of All Activities held at and outside the ICTP

Figures on research include long- and short-term scientists as well as Associate Members, some scientists from Federated Institutes and seminar lecturers.

Activity	Number of Visits			Number of Person/months		
	Dev.	Adv.	Total	Dev.	Adv.	Total
1. At the ICTP						
(a) Research:						
Fundamental Physics	98	108	206	215.70	171.53	387.23
Condensed Matter	70	26	96	188.91	70.60	259.51
Mathematics	112	36	148	334.82	67.58	402.40
Plasma Physics	14	-	14	36.33	-	36.33
Microprocessors Lab	5	2	7	27.39	7.73	35.12
High Tc Superc. Lab	12	5	17	40.47	16.27	56.74
Science, High Tech. & Dev.	1	6	7	0.03	0.37	0.40
Other	86	29	115	105.30	33.99	139.29
Total	398	212	610	948.95	368.07	1317.02
% Total vs. Grand Total	15.77	10.05	13.16	30.00	34.75	31.20
(b) Training for research (courses, workshops and conferences)						
Total	1979	1783	3762	1470.08	633.38	2103.46
% Total vs. Grand Total	78.47	84.50	81.78	46.48	59.80	49.82
2. Outside activities						
Italian Laboratories	107	-	107	719.40	-	719.40
Geometry and physics (held in Edinburgh)	17	3	20	4.70	1.41	6.11
Total	124	3	127	724.10	1.41	725.51
% Total vs. Grand Total	4.91	0.14	2.74	22.89	0.13	17.18
% Total vs. Grand Total	4.91	0.14	2.74	22.89	0.13	17.18
3. Co-sponsored activities						
Analogue VLSI design	-	43	43	-	16.89	16.89
Erasmus project	3	37	40	1.57	21.83	23.37
Med. development	20	17	37	18.07	14.88	32.95
Philosophy of Science	-	15	15	-	2.65	2.65
Total	23	112	135	19.64	56.25	75.89
% Total vs. Grand Total	0.91	5.31	2.91	0.62	5.31	1.80
GRAND TOTAL	**2524**	**2110**	**4634**	**3162.77**	**1059.11**	**4221.88**

Activities at ICTP in May/June 1992

Title: Spring College in Condensed Matter on "Superconductivity", 27 April – 19 June.

Organizing Committee: Professors N.H. March (Chairman, University of Oxford, UK), E. Burstein (University of Pennsylvania, USA), P.N. Butcher (University of Warwick, UK), P. Fulde (Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany), F. García-Moliner (Instituto de Ciencia de Materiales, Madrid, Spain), F. Gautier (Université Louis Pasteur, Strasbourg, France), I.M. Khalatnikov (Landau Institute for Theoretical Physics, Moscow, Russian Federation), S. Lundqvist (Chalmers University of Technology, Göteborg, Sweden, and ICTP), Chi Wei Lung (Institute of Metal Research, Shenyang, P.R. China), M.P. Tosi (Università di Trieste and ICTP, Trieste, Italy) and Yu Lu (Academia Sinica, Beijing , P.R. China, and ICTP).

Course Directors: Professors C.A. Balseiro (Centro Atómico Bariloche, San Carlos de Bariloche, Argentina), G. Baskaran (Matscience Institute of Mathematical Science, Madras, India) and F.C. Matacotta (Istituto per la tecnologia dei materiali metallici non tradizionali, Milan, Italy, and ICTP).

In co-operation with the International Centre for Science an High Technology (ICS, Trieste, Italy).

Lectures: Theory of metals. Overview on superconductivity. Josephson and related phenomena. BCS theory of superconductivity. Quasiparticles and Fermi liquid theory. Ginzburg-Landau theory of type II superconductivity. Strong-coupling theory of superconductivity. Ultrasonic and elastic studies of superconductivity. Central dogmas in the theory of high T_c superconductivity. Charge and spin separation in low dimensional systems. Heavy fermions, a general introduction. Magnetism and superconductivity. Chemical systematics in oxides. Spectroscopy studies of oxide superconductors. Physics and chemistry of oxides (theory). Electronic structure of oxide superconductors. Quantum chemistry of oxide superconductors. Heavy fermions and superconductivity (theory). Transport studies of oxide superconductors. μSR studies of oxide superconductors. New physics in high temperature superconductivity. Neutron scattering studies of oxide superconductors. NMR, NQR and EPR studies of oxide superconductors. Mott transitions and vortex phases in HTSC. Optical and Raman studies of oxide superconductors. Holes in quantum antiferromagnets. Theory of spin liquid state. Fullerenes. Tunnelling. Applications of superconductivity. Organic superconductors. Electronic and vibrational properties of fullerenes upon doping.

Special Seminars: Transport via localized states in tunnel junctions. Peak effect and melting of flux lattice. Data acquisition with the IEEE 488 bus. Landau, Kapitsa and others. OHM's law revisited. On relation between Berry phase and one dimensional models with $1/r^2$ long range interaction. Novel class of singlet superconductors with broken P and T invariance. Superconductivity with strong correlations.

Group Activity Lectures:

Spin liquid: Exactly soluble quantum antiferromagnets. Gauge vortices and nuclear relaxation rate in high T_c oxides. Hole spectrum and optical conductivity of high T_c superconductors. Quantum disordered phases in frustrated antiferromagnets. Spinon pair emission in Luttinger liquid: mechanism of NMR relaxation in high T_c materials. Néel order versus spin liquid in triangular quantum magnets (including the early history of RVB). Hole dynamics in the two band model. An introduction to the Lanczos method. Superconductivity from the RVB state: inter-layer pair hopping. Chern-Simons term and anyon superconductivity. Study of Ising frustrated ferromagnets. An effective Hamiltonian for the TJ model. Spin bags approach to the single hole motion in quantum antiferromagnet.

Phenomenology: HC_3 and surface superconductivity: possible occurrence in the high T_c oxides. Flux creep. Generation of hysteretic Jc(H) curves at low-fields for $YBa_2Cu_3O_7$-superconductors. How to measure the Cooper pair effective mass and their volume density using Bernoulli effect in superconductors. Excess conductivity in the paracoherence region — critical behaviour. Thermopower of high T_c materials: some theoretical predictions. Dynamics of the vortex state in HT_cS. Symmetry in high T_c ceramic superconductors. D-wave pairing in tetragonal superconductors. Dimensional effects in superconducting superlattices. The Abrikosov theory for vortex lattice (London limit). Fluctuation conductivity in layered high T_c superconductors.

Tunnelling: Single electron charging effects in ultra small tunnel junctions. Photon assisted tunnelling. Point contact

Spring College in Condensed Matter on "Superconductivity", 27 April – 19 June.

tunnelling studies on oxide superconductors. Break junction studies on high T_c superconductors.

Strong correlations / electronic structure: Effective Hamiltonian from a multiband Hubbard model. BCS approach to heavy fermion superconductivity. Foundations of strong-coupling theory. The Zaitsev diagrams technique for the Hubbard model. Critical current in YBaCuO. Axial oxygen (O IV) movement on $YBa_2Cu_3O_7$ as a possible mechanism of superconductivity. Spectral function of the Hubbard model and spectroscopy of strongly correlated systems. Experimental evidence against real-space pairing in high T_c superconductors. Mixed fermion - boson model for high T_c superconductors. Formation of a barrier upon self-localization of an electron within the 2-D Fröhlich lattice model. A stochastic approach to flux creep.

Experimental: Experimental setup for the transport properties measurement using closed-cycle refrigerator. Resistivity and Hall effect measurement in 2212 superconductors. Synthesis, characterization and studies (XPS, NMR) of single TI-0 layered high T_c superconductors. Magneto-optical observations of the magnetic flux structure in superconductors. Positron annihilation method and electronic properties of $YBa_2Cu_3O_7$. In-situ deposition high T_c films by pseudo spark ablation. Muon spin rotation measurements and doping in high T_c superconductors.

Informal discussion on C60.

Reports on Experimental Activities: Preparation and characterization (X-ray, AC susceptibility) of $BaPb_{1-x}Bi_xO_3$ samples. On the minimum in the Ic vs H curves for texture large grain Gd-B-C-O superconductors. Results of AC-susceptibility measurements on sintered and melt textured samples. Preparation and transport properties of Bi-2201 doped by Zn and Ni. IR and Raman spectroscopy of Bi-2201 doped by Zn and Ni.

The College was attended by 134 lecturers and participants (93 from developing countries).

ICS/ICTP/WMO International Workshop on Mediterranean cyclone studies, 18 – 22 May.

Title: ICS/ICTP/WMO INTERNATIONAL WORKSHOP ON MEDITERRANEAN CYCLONE STUDIES, 18 – 22 May.

Organizers: Professors Du Xingyuan (World Meteorological Organization, Geneva, Switzerland) and G. Furlan (University of Trieste and ICTP).

Lectures: Fifty years' experience of weather and climate on Mediterranean cyclone studies. Towards a systematic catalog of Western Mediterranean cyclones. PYREX results on mountain drag measurement and Lee-low formation. Atmospheric activity over the Mediterranean from the viewpoint of the planetary boundary layer. Saharian advection accompanying heavy rainfalls over the Algerian coasts. The energetics of Mediterranean cyclones. Analysis and diagnosis of the development of a Winter Mediterranean cyclone. Some appreciable tropospheric circulation features leading to surface cyclogenesis in the central Mediterranean region. Possibility of the land relief and translation trajectories of the Mediterranean cyclones. A case study of the deepening process over the Eastern Mediterranean. Mediterranean cyclones and the Rossby waves. East Mediterranean cyclogenesis and its connexion with the general circulation. A comparative analysis on structure of cyclones between East Asia and the Mediterranean. Factor separation in numerical simulations. High resolution experiments with the INM-LAM NWP model. Development and application of a limited area numerical model. Comparative application of the potential vorticity technique to Atlantic and Mediterranean cyclogenesis. The application of ECMWF operational numerical products to Mediterranean cyclones forecasting. Analysis and modelling of a summer case of alpine cyclogenesis. Numerical simulation of the development of a winter Mediterranean cyclone under the influence of variable orography and underlying surfaces. Cyclones to the South of the Mediterranean sea and their associated weather. Relating Mediterranean cyclones to tropical cyclones in the Southwest Indian Ocean. Tropical cyclone paradoxical influences on the weather over Zimbabwe. Seasonal synoptic patterns of East Mediterranean disturbances leading to flash floods over Egypt. An analysis of the low pressure centre influence on precipitation. Synoptical analysis of the events of heavy precipitation on the Southern slope of the Swiss Alps. The Malta cyclone and the evolution of the weather in Romania. Severe weather and cyclogenesis: a Western Mediterranean look. Evolution of Mediterranean cyclones over the Black Sea.

The Workshop was attended by 38 lecturers and participants (25 from developing countries).

Title: TRIESTE WORKSHOP ON THE SEARCH FOR NEW ELEMENTARY PARTICLES: STATUS AND PROSPECTS, 20 – 22 May.

Organizers: Professors G. Herten

(MIT, Cambridge, Mass., USA) and M. Perl (Stanford Linear Accelerator Center, Stanford, USA).

Lectures: The search for the top quark. Constraints on new physics from precision electroweak data. Massive lepton searches at LEP/SLC and LEP2000. Searches for SUSY particles at LEP/SLC and LEP2000. Searches for compositeness at LEP/SLC and LEP2000. Higgs searches at LEP/SLC and LEP2000. Higgs particles: models and general limits. Rare decays of the Z^0. Prediction for top and Higgs masses. Neutrinos in astrophysics and cosmology. Accelerator neutrino experiments: status and plans. Laboratory scale neutrino experiments: status and plans. Dark matter searches: status and prospects. Searches for massive stable particles from monopoles to quarks. Searches for new particles at a Tau-Charm factory. Searches for new particles at a B-factory. The LHC: programme and searches for new particles. The SSC: programme and searches for new particles. HERA: the first round of physics and beyond. Electron-positron linear colliders and searches for new particles.

The Workshop was attended by 38 lecturers and participants (11 from developing countries).

Title: SCHOOL ON DYNAMICAL SYSTEMS, 25 May – 5 June.

Organizers: Professors J. Palis (Instituto de Matemática Pura e Aplicada (IMPA, Rio de Janeiro, Brazil) and Ya. Sinai (Landau Institute for Theoretical Physics, Moscow, Russia). Prof. J. Moser (Eidgenossische Technische Hochschule Honggerberg, Zurich, Switzerland) was Honorary Director.

Lectures: First integrals for algebraic differential equations. Bifurcations, chaotic dynamics and attractors. Nonuniform hyperbolicity and strange attractors. Introduction to simplectic topology. Bifurcations, normal forms and Hilbert-Arnold's problem for polycycles. KAM theory. Ergodic theory. A cell mapping approach to the global analysis of Newton's root-finding method. Formulae for high order cycles in the quadratic map.

The School was attended by 104 lecturers and participants (64 from developing countries).

Title: SEVENTH TRIESTE SEMICONDUCTOR SYMPOSIUM ON: "WIDE-BAND-GAP SEMICONDUCTORS", 8 – 12 June.

The Symposium was promoted by the Steering Committee for Semiconductor Symposia in Trieste, under the auspices of the Italian Ministry for University and Scientific and Technological Research. It was organized by an international Advisory Committee and a Programme Committee, in cooperation with Gruppo Nazionale Struttura della Materia del Consiglio Nazionale delle Ricerche, and it was sponsored by Consiglio Nazionale delle Ricerche (Italian Research Council, CNR), Fondazione IBM Italia, University of Rome Tor Vergata, Xerox Corporation and ICTP.

Course Directors: Professors C.M. Bertoni (II Università di Roma, Rome, Italy), E. Tosatti (International School for Advanced Studies, SISSA, Trieste, Italy, and ICTP) and C.G. van de Walle, Chairman of the Programme Committee (Xerox Palo Alto Research Center, Palo Alto, USA).

Lectures: Thin films and devices of the wide band gap semiconductors of diamond, silicon carbide and the III-V nitrides of Al, Ga and In. Optical physics and laser devices in II-VI quantum confined heterostructures. Growth of GaN by ECR-assisted MBE. Progress in epitaxial growth of SiC. CVD growth and characterization of single crystalline 6H Silicon Carbide. Residual defect control when doping thin layers in diamond. Impurity incorporation and doping of diamond. ZnSe-based laser diodes and p-type doping of ZnSe. Ar ion laser-assisted metalorganic vapor phase epitaxy of ZnSe. Substrate quality, single crystal ZnSe for homoepitaxy using seeded physical vapor transport. Column V acceptors in ZnSe: theory and experiment. Pseudopotential total energy calculations of column-V acceptors in ZnSe. Electrical and optical characterization of SiC. Deep level defects in SiC. Blue-green II-VI ZnSe laser diodes. Characterization of II-VI compounds and devices. A new approach to wide bandgap visible light emitters. Compact visible electron beam pumped CdTe/CdMnTe lasers. II-VI quantum stark effect modulators. Nonlinear optically induced magnetic Kerr rotation in Mn-doped semiconductors. Doping limits in ZnSe. Characterization of ZnSe and other II-VI semiconductors by radioactive dopants. Intrinsic and extrinsic absorption and luminescence in diamond. Theory of impurities in diamond. Defects in nitride semiconductors. Conductivity control of GaN and fabrication of UV/blue GaN light-emitting devices. SiC and SiC-AlN solid solution pn structures grown by LPE. Blue LEDs, UV photodiodes and high temperature rectifiers in 6H-SiC. Bright visible light emission from electro-oxidized porous Si: a quantum dot model. Structural and electronic properties of SiC polytypes. Ab-initio molecular-dynamics study of structural and electronical properties of amorphous SiC. Electronic structure of gallium nitride. Band structures and high pressure phase transitions in GaN. Properties of interfaces of diamond. Electronic properties of SiC, III-nitrides and related materials. Intensity dependent optical properties of semiconductor quantum dots: assignment and dynamics of the electron-hole pair levels. Optical study of the piezoelectric field effect in (111)-oriented CdTe/CdMnTe strained quantum wells. Microscopic control of ZnSe-GaAs(110) band offset. Exciton dynamics in $Cd_{0.33}Zn_{0.67}Te/Zn/Te$ quantum wells.

Poster sessions.

The Symposium was attended by 140 lecturers and participants (13 from developing countries).

Title: WORKSHOP ON DYNAMICAL SYSTEMS, 8 – 19 June.

Organizers: Professors J. Palis (Instituto de Matemática Pura e Aplicada (IMPA, Rio de Janeiro, Brazil) and Ya. Sinai (Landau Institute for Theoretical Physics, Moscow, Russia). Prof. J. Moser (Eidgenossische Technische Hochschule Honggerberg, Zurich, Switzerland) was Honorary Director.

Lectures: Homoclinic bifurcations and large Hausdorff dimension. Genericity, nonlocal bifurcations and Hilbert-Arnold problem. Recent developments on Hénon-like strange attractors. Hilbert-Arnold's problem for elementary polycycles on the plane. On the geometric structure of Hénon-like strange attractors. Quasisymmetric conjugacies of unimodal maps. A new

Seventh Trieste Semiconductor Symposium on: "Wide-band-gap semiconductors", 8 – 12 June.

Lorenz-like strange attractor. Critical symbolic dynamics and local connectedness of Julia sets. Integrable systems and Birkhoff normal forms in resonant case. Mixing of special flows with logarithmic singularities. Hyperbolicity in lattice models of unbounded media. Uniformization of the leaves of rational vector fields. On the existence and positive denseness of Hénon-like strange attractors. On the stability (hyperbolicity) conjecture for real quadratic maps. The method of induced hyperbolicity. Stable controllability of generic control systems on surfaces. Singular Lagrangian varieties in Hamiltonian systems. Anosov convex Hamiltonians. Topological classification of integrable Hamiltonian systems. Rayleigh elliptic geodesics and quasi-modes. Length spectrum invariants of Riemannian manifolds. On the dychotomy of the arithmetic difference of affine Cantor sets. Convex billiards and a theorem of E. Hopf. The dynamics of the standard map: what is going on? The dynamics of area preserving twist maps and generalizations. Horocyclic flows and number theory. Expansive homeomorphisms and hyperbolic diffeomorphisms on 3-manifolds. Closed geodesic on generic hypersurfaces. Some counter-examples to theory of chaotic mappings. TBA. Stochastic reaction-diffusion equation. The theory of Burgers equation. Explosions of singular cxycles. Closed geodesics and continued fraction expansion with even partical quotients. The Poincaré-Lyapunov-Liouville-Arnold theorem. Chebyshev systems, characteristic equivalence and cusp of order n. Problems and perspectives in the theory of dynamical systems. Nekhoroshev estimates for quasi-convex Hamiltonians. Hyperbolic attractors with singularities. Topological classification of subhyperbolic polynomials with connected Julia sets. KAM curves and strange attractors. A survey on the stability of one-parameter families of dynamics. Lines of curvature and dynamics. Noninvertible two-dimensional maps. Topological dynamics of triangular maps. Dynamic prototypes for full families of multimodal maps. Contact 3-manifolds, integrable Hamiltonian systems and exotic symplectic structures in R^4. Anosov flows and suspensions. Homoclinic orbits to invariant tori of symplectic maps. Residually C^0 attractors are conjugate to hyperbolic ones. Limit sets and minimal attraction centers for continuous maps. Self-stochasticity. Poincaré compactification in celestial mechanics. On the inversion of functions.

The Workshop was attended by 108 lecturers and participants (66 from developing countries).

Title: MINIWORKSHOP ON STRONGLY CORRELATED ELECTRON SYSTEMS IV, 15 June – 10 July.

Organizers: Professors G. Baskaran (Matscience Institute of Mathematical Science, Madras, India), P. Chandra (NEC Research Institute, Princeton, USA), P. Coleman (Rutgers State University, Piscataway, USA), E. Tosatti (International School for Advanced Studies, SISSA, Trieste, Italy, and ICTP) and Yu Lu (Academia Sinica, Beijing, P.R. China, and ICTP).

Lectures: Questions, themes and questionable themes in strongly correlated systems. Novel class of singlet superconductors with broken P and T invariance. Electronic structure of cuprate superconductors: current status of understanding. Spin 1 chain. Fermi surface dispersion in strongly correlated systems. Experimental studies of

fullerenes. Random phase approximation for a crystal with two electron bands. Perovskite superconductors in high dimensions. Experimental studies of C-60 II. Heavy fermion superconductors and the flux lattice in UPt_3. C-60 superconductors — overview of theory. Some recent results in cuprate superconductors. Introduction to the theory of the FQHE. Jastrow conductors and magnets: some explicitly solvable 1D models. Charge spin separation in 1d and quasi 1-d t-J models. Hydrodynamics of low dimension quantum antiferromagnets. Optical conductivity of 2212 — some new results. Exotic properties of He-3. Metal insulator transition in the infinite dimensional Hubbard model. Fermi liquid and non-Fermi liquid phases in an extended Hubbard model in infinite dimensions. Gauge theories of strongly correlated systems. Quantum frustrated spin systems. The Kagomé antiferromagnet — a topological spin glass? 1-d Hubbard model in magnetic field and the equivalent Tomonaga model. Heavy-fermion magnets, super- and semiconductors.

Discussions: Novel PT breaking superconductors. Fractional quantum Hall effect and 1d phenomena — are there connections? Quantum antiferromagnetism. C-axis optical conductivity of cuprates — the confinement controversy. Normal state properties of cuprate superconductors. Numerical methods and high temperature expansions. Non-Fermi liquid behaviour in low dimensional systems. Gauge theories. Some new 1D field theories. Finite size studies of 2D strongly correlated electron systems. Future directions for condensed matter theory.

Mini-symposium on numerical studies of Hubbard and t-J model.

The participants in the Miniworkshop also attended plenary seminars of the Research Workshop in condensed matter, atomic and molecular physics and the lectures of the Symposium on frontiers in condensed matter physics.

The Miniworkshop was attended by 73 lecturers and participants (34 from developing countries).

Title: ADRIATICO RESEARCH CONFERENCE ON CLUSTERS AND FULLERENES, 23 – 26 June.

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 (University of Trieste and Scuola Normale Superiore, Pisa, Italy) and Yu Lu (Academia Sinica, Beijing, P.R. China, and ICTP).

Course Directors: Professors V. Kumar (Indira Gandhi Centre for Atomic Research, Kalpakkam, India, and ICTP), T.P. Martin (Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany) and E. Tosatti (International School for Advanced Studies, SISSA, Trieste, Italy, and ICTP).

In co-sponsorship with Fondazione IBM Italia and the International School for Advanced Studies (SISSA, Trieste, Italy).

Lectures: The fullerenes. Metal clusters. Discovery and isolation of solid C_{60}. Superconductivity in the A_3C_{60} compounds. Electronic transport and magnetic properties of K_3C_{60} and Rb_3C_{60} in high magnetic fields. Isotope effect and thermomagnetic measurements in A_3C_{60}. Bandgap, excitons and Coulomb interaction in solid C_{60}. Atomic structure of metallic clusters of medium size. Fullerenes and functionalized fullerenes: structures and stabilities. Metallo-carbohedrenes — a new class of molecular clusters. Clusters with novel properties. Small is different. Theoretical studies of endohedral complexes of C_{60} and dodecahedral gas-phase clathrates of $(H_2O)_{20}$. On the theory of C_{60} superconductors. Coulomb pseudo-potential and screening in C_{60}. Neutron scattering studies of superconducting and insulating fullerides. Raman scattering and superconductivity in alkali-fullerene materials. Photoelectron spectroscopy of unsupported metal clusters. Spectroscopy of size-selected neutral semiconductor clusters: bulk like spectra seen in "molecular size" clusters. Phases and phase equilibria: clusters to bulk matter. Fluid metals in the liquid-vapour critical region. Supershells in metal clusters. Collective excitations in pure and impurity doped metal clusters. Tight-binding molecular dynamics study of carbon clusters. Fullerenes-surface and fullerene-fullerene interactions. Evaluation of linear and non-linear microscopic polarizabilities of C_{60} and its doped species. Delayed electron emission from fullerenes. Structural and electronic properties of the C_{60}/Cu interface and of K_xC_{60} films. Evidence of Jahn-Teller distortion and low energy electronic excitation from FT-Raman scattering in Rb Doped C_{60}. Collective electronic excitations in carbon fullerenes. Electron correlations in fullerenes and superconductivity. STM studies of anomalous carbon structures. Magnetic properties of transition metal clusters in a molecular beam. Atomic and electronic structure of clusters. Ab-initio molecular dynamics studies of fullerenes. Dynamics of clusters and polymers. Structure, dynamics and formation of carbon and aluminum clusters. Electron microscopy study of graphite particles formed in arc-discharge experiments. Soft X-ray photoelectron and photoabsorption studies of C_{60} and K_xC_{60}. Optical nonlinearity of Buckminsterfullerene and its derivatives. Geometrical and electronic structure of C_{60} anions. Femtosecond time-resolved investigatons of photoexcited states in C_{60}.

The Conference was attended by 97 lecturers and participants (27 from developing countries). ♦

Associate Members Expected at ICTP in 1992

KEY:

BIO	Biophysics	MATH	Mathematics
CLIMA	Climatology	NON-CONV.EN	Nonconventional Energy
COMM.	Communications Physics	NP	Nuclear Physics
GEO	Geophysics	SOIL	Soil Physics
HE	High Energy Physics	SS	Solid State Physics

Name	*Member State*	*Field*	*Scientific Support*	*Visit Period month/day*
PROTO, A.N. (Ms.)	ARGENTINA	SS	TOSATTI	07/30 - 08/19
SEVERCAN, M.	TURKEY	COMM. PHYSICS	COLAVITA/NOBILE	08/01 - 09/19
ONWUAGBA, B.N.	NIGERIA	SS	TOSATTI	08/01 - 10/30
YORMAH, T.B.R.	SIERRA LEONE	SOIL	FURLAN/GHIRARDI	08/01 - 09/30
KANHERE, D.G.	INDIA	SS	YU-LU	08/02 - 08/25
ZHANG, Yuan Zhong	CHINA	HE	RANDJBAR	08/05 - 10/25
CABO, A.G.	CUBA	SS	TOSATTI	08/05 - 09/05
CHEIKH, O. H.	MAURITANIA	MATH	VERJOVSKY/VIDOSSICH	08/06 - 10/15
MESKINI, N.	TUNISIA	SS	TOSATTI	08/09 - 09/06
FAKHFAKH, Z.	TUNISIA	BIO	BORSELLINO/GHIRARDI	08/09 - 09/20
PRASAD, R.	INDIA	SS	YU-LU	08/09 - 09/06*
KUKU, T.A.	NIGERIA	NON-CONV.EN	FURLAN	08/10* - 09/04*
PATHAK, K.N. (Senior)	INDIA	SS	YU-LU	08/10 - 09/10
SEDDIGHI, K.	IRAN	MATH	VERJOVSKY/VIDOSSICH	08/11 - 09/29
HAO, Bai-Lin	CHINA	SS	YU-LU	08/11 - 10/10
TYAGI, R.S.	INDIA	MICRO	COLAVITA	08/12 - 09/25
ISMAIL, M.	SUDAN	MATH	VERJOVSKY/VIDOSSICH	08/14 - 10/02
AWANOU, C.N.	BENIN	NON-CONV.EN	FURLAN	08/15* - 10/01*
GONG, Changde	CHINA	SS	YU-LU	08/15 - 11/15
ADIBE, E.C.	NIGERIA	CLIMA	FURLAN/STRAVISI	08/15 - 11/09
BASNET, K.	NEPAL	SOIL	GHIRARDI	08/15 - 11/15
EZIN, J.P.	BENIN	MATH	VERJOVSKY/VIDOSSICH	08/15 - 09/28
RIAZUDDIN (Senior)	SAUDI ARABIA/PAKISTAN	HE	RANDJBAR	08/16 - 09/02
AINA, P.O.	NIGERIA	SOIL	GHIRARDI	08/17 - 10/29
JAIN, P.C. (Senior)	INDIA	NON-CONV.EN	FURLAN	08/17* - 08/21*
CHUKWUMAH, G.C.C. (Senior)	NIGERIA	HE	RANDJBAR	08/18 - 09/17*
ADJEPONG, S.K.	GHANA	GEO	FURLAN/PANZA	08/20 - 10/31
CHEN, Shuxing	CHINA	MATH	VERJOVSKY/VIDOSSICH	08/20 - 11/20
AMUASI, J.H.	GHANA	MEDICA PHYSICS	BERTOCCHI/GHIRARDI	08/21 - 10/01
DABBOUR, A.E.S.	EGYPT	MATH	VERJOVSKY/VIDOSSICH	08/21 - 09/27
BERKANI, M.	MOROCCO	MATH	VERJOVSKY/VIDOSSICH	08/24 - 10/11
AWIN, A.M.	LIBYA	NP	DALAFI/FONDA	08/24 - 10/04
EKHAGUERE, G.O.S.	NIGERIA	MATH	VERJOVSKY/VIDOSSICH	08/25 - 11/24
SEN GUPTA, H. (Senior)	BANGLADESH	NP	DALAFI/FONDA	08/26 - 09/05
KYERE, A.K.	GHANA	BIO	BORSELLINO/GHIRARDI	08/28 - 11/06
ISLAM, A.K.M.A.	BANGLADESH	SS	YU-LU	08/28 - 10/16*
MAHDAVI-HEZAVEHI, M.	IRAN	MATH	VERJOVSKY/VIDOSSICH	08/29 - 09/24
ZHANG, Xianke	CHINA	MATH	VERJOVSKY/VIDOSSICH	08/29 - 11/29
AHMAD, Israr	INDIA	NP	DALAFI/FONDA	08/29 - 11/26

(contd.)

Name	*Member State*	*Field*	*Scientific Support*	*Visit Period month/day*
BARYEH, E. A.	IVORY COAST/GHANA	NON-CONV.EN	FURLAN	08/30 - 10/30*
BHATTARAI, H.N.	NEPAL	MATH	VERJOVSKY/VIDOSSICH	08/30 - 11/28
EDEE, M.K.A.	TOGO	BIO	BORSELLINO/GHIRARDI	08/30 - 11/13
HUSSEIN, A.Z. (Senior)	EGYPT	NP	DALAFI/FONDA	08/31* - 09/18*
ELION-MBOUSSA, A.	CONGO	BIO	BORSELLINO/GHIRARDI	09/01 - 11/30
FENG, Yu-Yu	CHINA	MATH	VERJOVSKY/VIDOSSICH	09/01 - 11/30
RAJPUT, A.Q.K.	PAKISTAN	COMM. PHYSICS	COLAVITA/NOBILE	09/01 - 11/29
HE, Shan-Yu	CHINA	MATH	VERJOVSKY/VIDOSSICH	09/09 - 12/09
KUMARAVADIVEL, R.	SRI LANKA	SS	YU-LU	09/15 - 12/15
AWUNOR-RENNER, E.R.	SIERRA LEONE	GEO	FURLAN/PANZA	09/16 - 12/14
RAMBOLAMANANA, G.	MADAGASCAR	COMM. PHYSICS	COLAVITA/NOBILE	09/23 - 12/14
PU, Fucho	CHINA	SS	YU-LU	10/01 -01/01/93*
FAMUREWA, O.	NIGERIA	BIO	BORSELLINO/GHIRARDI	10/01 - 11/30
FERNANDEZ, A.	CUBA	MEDICAL PHYSICS	BERTOCCHI/GHIRARDI	10/02 - 11/28
KHAN, M.A.	PAKISTAN	BIO	BORSELLINO/GHIRARDI	10/04 - 11/22
LEE, F.T.	MALAYSIA	SS	YU-LU	10/15* - 11/26*
ALIAGA, J.L.	ARGENTINA	SS	TOSATTI	10/19 - 12/12

ICTP Programme for Training & Research in Italian Laboratories
List of ICTP Fellows yet to Start in 1992

Name *Institution* *Member State*	*Starting Date (M/D/Y)*	*Final Date (M/D/Y)*	*Host Laboratory*	*Supervisor*	*Field*
Chen Pijin Dept.Information Electronics Tsinghua University Beijing China	9/14/92	11/13/92	CNR Ist.Metrologia G.Colonnetti Torino	Calcatelli A.	Cond. Matter
Danailov, M.B. Dept. of Physics Technical University Varna Bulgaria	10/19/92	10/18/93	CNR Ist. di Fisica del Politecnico Milano	Svelto O.	Laser Phys.
Kuku, T.A. Electronics & Electrical Dept. Obafemi Awolowo University Ile-Ife Nigeria	9/13/92	2/12/93	Univ. Dip. di Fisica Parma	Romeo N.	Energy
Milosevic, S. Institute of Physics Zagreb Croatia	10/1/92	3/31/93	Univ. Dip.di Fisica Pisa	Arimondo E.	Laser Phys.
Mohan, Pardeep National Physical Laboratory K.S.Krishnan Marg New Delhi India	11/16/92	11/15/93	CNR Ist.Metrologia "G.Colonnetti" Torino	Calcatelli A.	Cond. Matter

(contd.)

Name *Institution* *Member State*	*Starting Date (M/D/Y)*	*Final Date (M/D/Y)*	*Host Laboratory*	*Supervisor*	*Field*
Okunade, A.A. Physics Dept. Obafemi Awolowo University Ile-Ife Nigeria	9/1/92	8/31/93	ENEA - C.R.E. Lab.Metrologia delle Rad.Ionizzanti Rome-Casaccia	Laitano R.F.	Medical Phys.
Oyinloye, J.O. Dept.of Physics Univ.of Ilorin Ilorin Nigeria	12/2/92	6/1/93	Ist.Naz.Geofisica Rome	Zolesi B.	Climatology
Raspini, I.A. Comisión Nacional de Energía Atómica Buenos Aires Argentina	10/5/92	10/4/93	CISE Milano	Rossini F.	Cond.Matter
Rzoska, S.J. Institute of Physics Silesian Univ. Katowice Poland	9/1/92	8/31/93	Univ. Dip.di Elettronica Pavia	Degiorgio V.	Laser Phys.
Tran Nhung Hong Research Centre for Applied Physics Hanoi Viet Nam	10/5/92	10/4/93	CISE Milano	Rossini F.	Cond.Matter
Trivi, M. Centro de Investigaciones Opticas La Plata Argentina	9/26/92	10/25/92	Ist.Nazionale di Ottica Arcetri(Firenze)	Arecchi F.T.	Laser Phys.
Wang Dadi Institute of Physics Chinese Academy of Sciences Changchun China	11/6/92	11/5/93	CNR I.R.O.E. Firenze	Pantani L.	Laser Phys.
[illegible] China					
Yao Yongbang Academia Sinica Anhui Institute of Optics & Fine Mech. Hefei China	9/14/92	9/13/93	Univ. Dip. di Fisica Lecce	Luches A.	Laser Phys.
Zhao Mingjun Inst. of Optics & Precision Mechanics Academia Sinica Xian China	10/20/92	10/19/93	Ist. Nazionale di Ottica Firenze	Arecchi F.T.	Laser Phys.

Calendar of Activities at ICTP 1992

Research Workshop in condensed matter, atomic and molecular physics ..... 22 June – 11 September

Miniworkshop on non-linearity: dynamics and surfaces in nonlinear physics ..... 13 – 24 July

Adriatico Research Conference on wrinkling of surfaces in nonlinear systems ..... 21 – 24 July

Adriatico Research Conference on synergetics in condensed matter ..... 4 – 7 August

Miniworkshop on methods of electronic structure calculations ..... 10 – 21 August

Workshop on tropical climate variability and regional impacts ..... 17 – 21 August

Adriatico Research Conference on hydrogen atoms in intense electromagnetic fields ..... 18 – 21 August

Course on low-dimensional quantum field theory for condensed matter physicists ..... 24 August – 4 September

Advanced Workshop on arithmetic algebraic geometry ..... 31 August – 11 September

College on medical physics: imaging and radiation protection ..... 31 August – 18 September

Workshop on commutative algebra ..... 14 – 25 September

Fourth International Conference on applications of physics in medicine and biology:

advanced detectors for medical imaging ..... 21 – 25 September

WMO Workshop on limited area modelling ..... 28 September – 2 October

College on methods and experimental techniques in biophysics ..... 28 September – 23 October

Second College on microprocessor-based real-time control — Principles and applications in physics ..... 5 – 30 October

Second Trieste Conference on recent developments in the phenomenology of particle physics ..... 19 – 23 October

Conference on chemical evolution and the origin of life ..... 26 – 30 October

School on physical methods for the study of the upper and lower atmosphere system ..... 26 October – 6 November

Second Autumn Workshop on mathematical ecology ..... 2 – 20 November

Workshop on three-dimensional modelling of seismic waves generation,

propagation and their inversion ..... 30 November – 11 December

Preliminary 1993 Scientific Programme

Sixth International Workshop on computational condensed matter physics ..... 11 – 13 January

Experimental Workshop on high temperature superconductors and related materials

(advanced activities), San Carlos de Bariloche, Argentina ..... 11 – 29 January

Fourth Training College on physics and technology of lasers and optical fibres ..... 18 January – 5 February

Second Workshop on functional-analytic methods in complex analysis

and applications to partial differential equations ..... 25 – 29 January

Third ICTP-URSI College on theoretical and experimental radiopropagation physics ..... 1 – 26 February

Winter college on optics ..... 8 – 26 February

Workshop on scientific aspects of the rural communications in developing countries ..... 1 – 5 March

Adriatico Research Conference on quantum interferometry ..... 2 – 5 March

Conference on "Highlights of particle and condensed matter physics" ..... 8 – 12 March

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

Spring School and Workshop on superstrings ..... 19 – 30 April

Meeting on "Intracellular channels, organelles and cell function" ..... 21 – 23 April

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

School on ocean-atmosphere interactions in the Tropics ..... 10 – 28 May

School on ocean-atmosphere interactions in the Tropics ..... 10 – 28 May

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

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

Summer School in high energy physics ..... 14 June – 13 August

including

Third School on non-accelerator particle astrophysics ..... 28 June – 10 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 scattering from surfaces ..... 6 – 9 July

Miniworkshop 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

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

Workshop on radioecology: mechanisms of transfer of radionuclides to the environment ..... 11 – 29 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

Trieste Conference in high energy physics ..... 8 – 12 November

Second Workshop on non-linear dynamics and earthquake prediction ..... 8 – 26 November

Workshop on VLSI technology ..... 22 November – 3 December

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

International Centre for Theoretical Physics
of IAEA and UNESCO
Strada Costiera, 11
P.O. Box 586
34014 Trieste
Italy

Telephone: (40) 22401
Cable: CENTRATOM
Telex: 460392 ICTP I
Telefax: (40) 224163
E-mail: POSTOFFICE@ICTP.TRIESTE.IT
Bitnet: POSTOFF@ITSICTP
Decnet: VXICP1::POSTOFFICE
or 38436::POSTOFFICE
PPSDN: 022224110125

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. M. Farooque, Scientific Information Officer.