

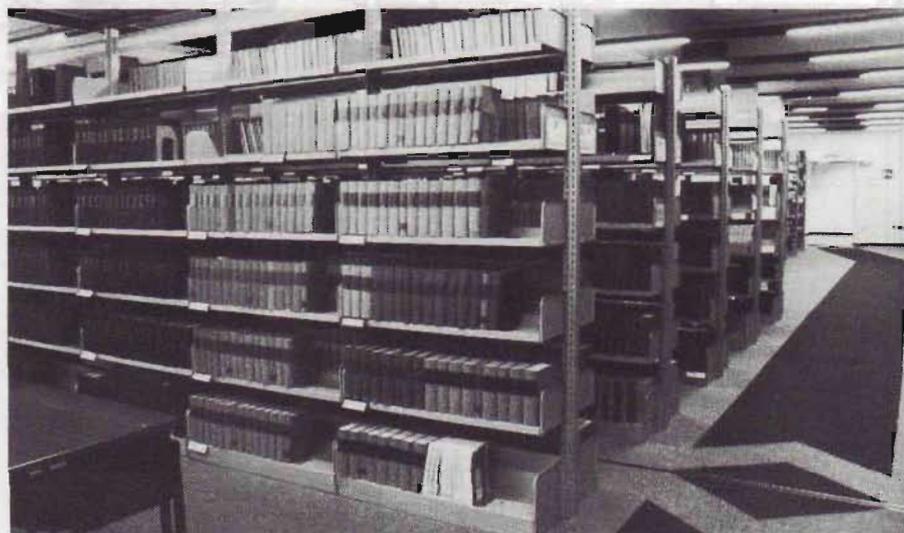


International Centre for Theoretical Physics

News from ICTP

No. 52/53

November/December 1991



The ICTP Library

The International Centre for Theoretical Physics (ICTP) Library is twenty-seven years old. It started in 1964 when the Centre was founded by the International Atomic Energy Agency (IAEA). The Library serves the needs of the heterogeneous scientific community present at the Centre.

The heterogeneous scientific community present at the Centre.

Located on the first floor of the Main Building of ICTP, the Library has just terminated its settlement into the new wing which, together with the renovated old wing, forms a vast and ideal study area.

This expansion was long awaited and mandatory as for several years the collection was divided and placed on various floors of the three ICTP buildings, with great uneasiness to users and staff.

Now, with the availability of 50 studying tables, comfortable lounge chairs and reading areas, the Library offers a nice and peaceful spot for

consultation and study. At the entrance of the Library, a convenient space is allocated for reading and consultation of reference material, display of new journal arrivals and the loan desk.

The collection today is of ab. 50,000 books, 50,000 bound volumes of scientific journals, 50,000 bound volumes of scientific journals, and 60,000 preprints representing the last five years (received from the most quoted scientific institutions world-wide). Acquisitions amount to ab. 3,000 books and 1,200 subscriptions to journal titles.

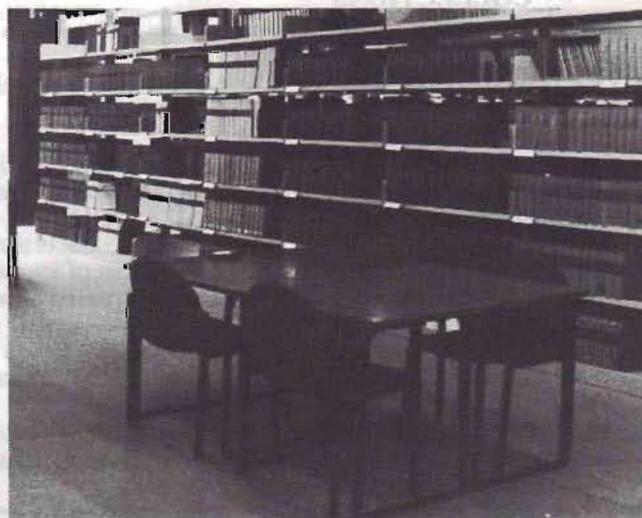
Initially, the Library covered the multidisciplinary fields in elementary

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particle physics, nuclear physics, plasma physics, condensed matter and mathematics. Later, it expanded with physics and energy, physics and the environment, physics of the living state, applied physics, space physics and physics and mathematics teaching.

physics and mathematics teaching.



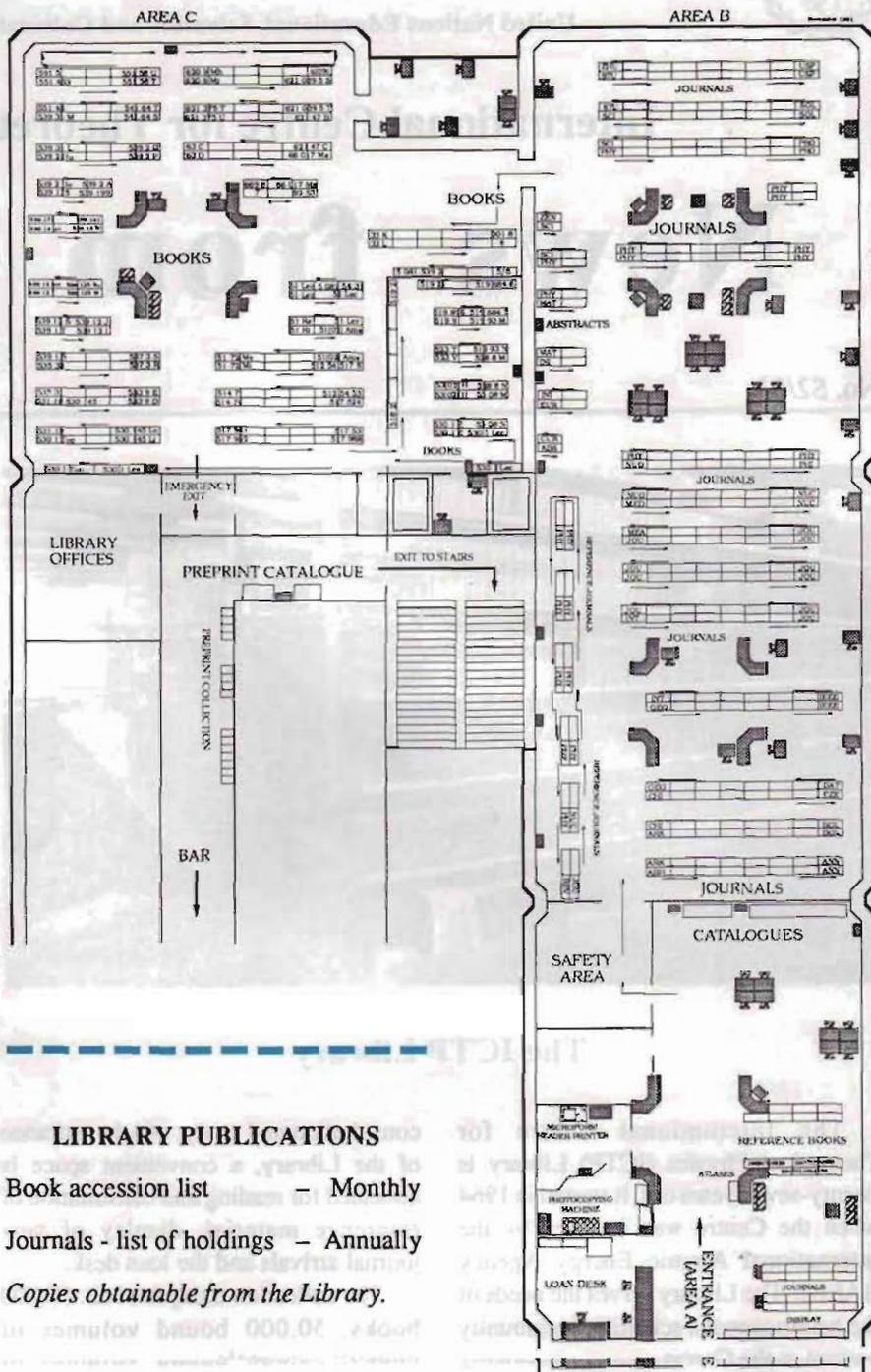
Library reference and information services are provided not only to ICTP visitors, but also to other local organizations such as the International School for Advanced Studies (SISSA), Third World Academy of Sciences (TWAS), International Centre for Science and High Technology (ICS) with its satellite laboratories, and the Department of Theoretical Physics which is housed in the ICTP Main Building.

Annually, the Library registers ab. 25-30,000 loans between books and journals, processes ab. 500 inter-library loans, plus circulates ab. 9-10,000 preprints. The annual number of visitors ranges from 4-5,000.

Among the services, the Library offers the display and circulation of newly arrived preprints. This almost unique service is a "must" for scientists to keep abreast of their particular field of interest.

The ICTP Library is staffed by one Professional and nine General Service, grouped in five units: administration, cataloguing, acquisitions, serials/preprints and loans.

The plans for 1992, funding permitting, foresee the computerization of library services to meet international standards, permitting the utilization of on-line access to library holdings and dissemination of information either through local and/or international networks.



LIBRARY PUBLICATIONS

Book accession list - Monthly

Journals - list of holdings - Annually

Copies obtainable from the Library.

LAYOUTS AND LAYOUTS AND COLLECTIONS

Area A (Library entrance):

- Information
- Loan services
- Display of newly arrived journals
- Book catalogues
- Reference tools:
 - Dictionaries, Handbooks, Annuals, Encyclopaedias, Statistics, Atlases, Directories et al.
- Reference books (duplicate copies)
- Microfiches catalogue
- Film/Fiches reader-printer
- Photocopying machine
- Reading area

Area B - Journals (in alphabetical order by title):

- Loan collection
- Reference journals (duplicate copies)
- Abstracts and indexes
- List of journals
- Reading area

Area C - Books (according to the Universal Decimal Classification):

- Loan collection
- Reading area

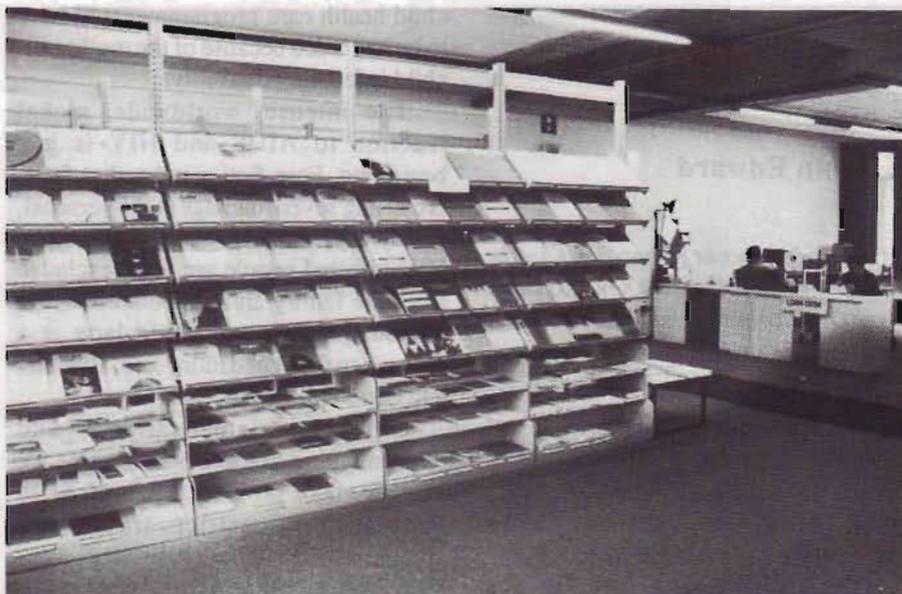
Corridor - Preprints:

- Catalogue
- Preprint files
- Display of newly arrived papers (Bar area)

Adriatico & Galileo Guest Houses:

- Small easy reading collection
- Small religious collection

(Information and accessibility from the respective receptionists.)



SERVICES AND FACILITIES

Loans

Books, periodicals and preprints may be borrowed for 1 month up to a maximum of 5 each at a time. During courses some restrictions on the number and period of loan may be applied according to the circumstances.

Material Not for Loan

Reference books and periodicals, and any material on temporary display, such as newly arrived journals, preprints, or material specifically needed during courses.

Inter-Library Loans

This service is provided when important material is not available in the Library collection. Requests that have to be made outside Trieste must be paid by requestor.

Copying Facilities

Self-service photocopying machines are available either inside or outside the Library for those who wish to copy Library material. The machines must be operated by means of magnetic cards which cost Lit. 50 per copied page. Books should not be copied as they are bound to international copyright restrictions.

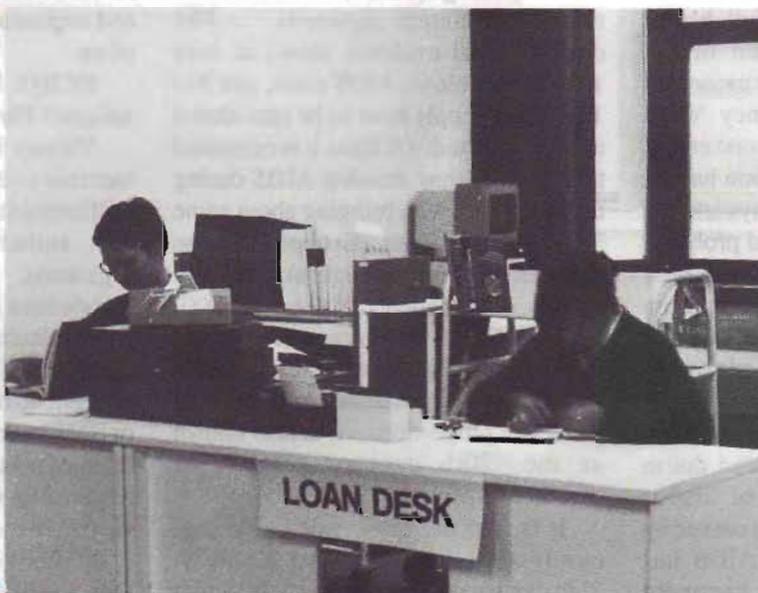
ICTP LIBRARY USEFUL INFO

Library Hours

Mon – Fri
8:30 a.m. – 8:00 p.m.

Sat – Sun
9:30 a.m. – 8:00 p.m.

Information desk
ext. 306



User Education

The Library provides guidance in the use of the collections and resources through guided tours. For those attending courses and arriving on the same dates, a general lecture is given by the Head Librarian within the first days of arrival. An announcement is made on the course programme.

New Arrivals

Periodicals: the latest issues are displayed daily at the entrance of the Library.

Preprints: the latest arrivals are displayed daily in the reading corner, in front of the Bar in the Main Building, for 7 days; and are then circulated to the requestors. ♦



Spotlighting AIDS

An Interview with Dr. Robin Edward

Startled by the alarming proportions that this modern scourge has taken in the recent months, and eager to inform fellow staff members in the most knowledgeable way, ECHO⁽¹⁾ has asked the following questions to Dr. Edward⁽²⁾ who chaired the UN AIDS-panel in Vienna on World AIDS Day (Dec. 1, 1988). Here are his answers.

ECHO: What is a realistic estimate of the number of the AIDS- and/or HIV-infected people worldwide and how is it expected to vary until the year 2000?

Dr. Edward: First of all, one has to differentiate between the terms 'HIV-infected individuals' and 'full blown AIDS' cases. The spectrum of the Immunodeficiency Syndrome caused by the Human Immunodeficiency Virus (HIV) is a very broad one. At one end of this spectrum we find the person having had an exposure in various ways and the HIV residing in this individual probably for life without causing any illness. For all practical purposes, this individual can be called healthy except, of course, that he or she is potentially capable of causing infection to unprotected sexual partners. At the other end we find the person whose resistance to disease is so lowered, due to the progressive breakdown of his/her immune response mechanisms caused by this virus, that full blown AIDS has developed, challenging all treatment measures. Between these two extremes one can find a large variety of cases showing less severe forms of disease manifestations like affections of the nervous system.

It is thought that this infection which took roots in the 1970s and is doggedly spreading today has truly taken the scope of being called 'pandemic', defying geographic boundaries, races, age and sex — proliferating worldwide, in stark contrast to other epidemics the world has known. In the history of medicine there has been no other disease-causing agent which was so baffling as this virus, challenging world economy and social

order so drastically.

Furthermore, the spread of this virus follows an exponential curve, virtually doubling every year (see chart). So far 144 countries have reported some 125,000 cases, but due to the deficiency of the reporting systems, that number has to be adjusted upwards. The circumstantial evidence shows at least 150,000 full blown AIDS cases, and 5 to 10 million people have to be considered as HIV-infected. Of these it is estimated that 10-30% may develop AIDS during the next five years, bringing about some 3,000,000 new cases. Extrapolating the exponential curve we might expect 6 to 7 million AIDS patients by the year 2000!

ECHO: What are the repercussions of AIDS worldwide?

AIDS is a new worldwide problem of pandemic proportions. It is also known as the '20th century plague' or 'mankind's newest killer'!

It is also the disease of the young, mostly of those aged between 20 and 39. This challenges any country's economy because it directly affects people at the peak of their productivity. It may result in a future generation gap of persons between 45 to 50, or in some cases in population groups consisting only of demented people caused by neuropsychiatric manifestations.

The average medicare costs of an AIDS patient amount to US \$ 25,000 to 150,000! Even in the highly developed countries, this will be felt strongly in health budgets, not to speak of the developing countries where this additional burden on already strained resources will be fatal, especially that

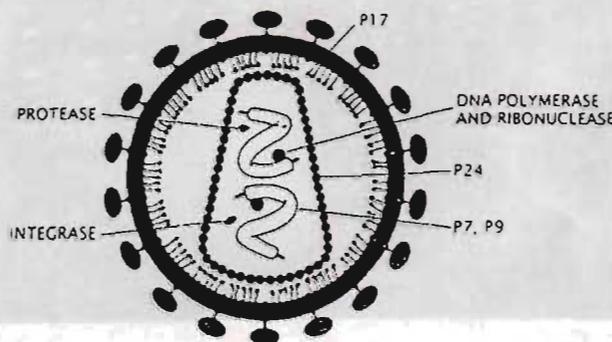
child health care programmes will have to be upgraded because of the mother-to-child infection possibility.

The intense, worldwide, global reaction to AIDS and HIV is just beginning. Fear, fiction rather than facts, is causing severe damage at the personal, family and social levels. For example, HIV-infected people are often excluded from the family and the community — without justification, particularly at a time when they need more care, attention and communication.

Unjust stigmatisation and discrimination at the working place are another major problem. Fear of AIDS threatens to restrict travel and communication among countries. Thus HIV may prove to be a threat to the fundamental values of human society and impose a formidable challenge on all of us.

ECHO: In which way is the HIV unique? How infectious is AIDS?

Viruses in general are smaller than bacteria — about 20-30 nm (nanometer, millionth of a mm), and, unlike the latter, are rather 'incomplete' microorganisms. Viruses lack independent metabolism and therefore reproduce or cause infection only when they are within a host cell. The virus particle contains all the genetic material (nucleic acids DNA or RNA) necessary for programming the infected host cell to synthesize molecules required for viral reproduction. Thus any virus, after entering a particular host cell of its choice and preference, is not only able to kill the host cell but also begins to reproduce (replication) inside the nucleus in large numbers, which break out and infect other cells. Less virulent viruses like those of the 'flu' implant themselves through airborne transmission directly on the inner surfaces of the nose and the respiratory tract, causing damage to the mucosa



⁽¹⁾ Staff Journal of the International Atomic Energy Agency (IAEA).

⁽²⁾ Chief Medical Officer, IAEA.

cells.

Different viruses search for the cells of their own priority and choice. HIV, which is an RNA virus, belongs to a retrovirus group and has a predisposition to go in for a type of white cell called 'lymphocyte of T group', and in particular helper-T cells, first invading the cell after getting adhered to a particular receptor site (CD4), penetrating inside the nucleus of the host cell injecting its RNA. With the help of an enzyme called 'Reverse Transcriptase' it can instruct the host cell to make 'copies' of its own genetic material DNA which inserts itself into the human cell and becomes 'part' of it and cannot be differentiated. Thus it escapes and evades all monitoring mechanisms directed towards the virus, and the infection becomes irreversible. A bacteria is not capable of doing this genetic penetration by virtue of its independent metabolism.

If the lymphocytes are looked upon as 'soldiers defending a country' the situation is akin to a hypothetical condition where these soldiers are not only destroyed but are replaced by enemy soldiers! Thus the very cells responsible for producing immune defence response meant to kill an invading micro-organism are destroyed and in their place new virus 'factories' are set up causing further proliferation and attacking other

host cells.

To make matters worse, antibodies produced by the lymphocytes are not capable of neutralizing the viral particle! The virus in circulation is thus able to spread to all other parts and can also be transmitted to sexual partners, through blood transmission and from mother to child.

The modes of transmission of the virus have been well studied: the highest rate has been found to result from sexual

The three ways in which the AIDS virus may be transmitted are:

- Sexual intercourse
- Transfer of contaminated blood or blood products
- From mother to child

The ways in which the AIDS virus may not be transmitted are:

- Casual contacts:
 - Handshakes
 - Kissing (without the exchange of saliva)
 - Recreational activities (including skin contact)
 - Swimming in public pools
 - Using the toilets of infected people
- Foodborne:
 - Food, drinks
- Airborne:
 - Sneezing
 - Coughing
- Insect borne

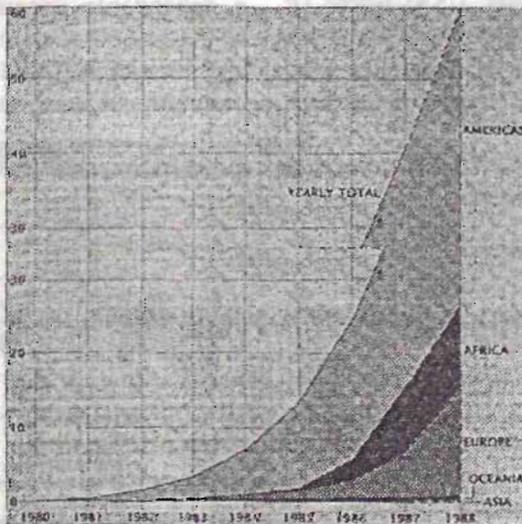
intercourse (male to female, female to male, male to male); next, through infected blood transmission (drug injecting behaviour and transfusions); and, in the third place, from mother to child, prior to or during or shortly after birth, occasionally through breast milk.

HIV has a lipid coat (fat) derived from host cell and is therefore very sensitive to fat dissolving solutions or heat. Thus it is a *fragile* virus and can easily be killed — in sharp contrast to Hepatitis B virus.

Now, talking about the modes of transmission of this fragile virus: there is no evidence to show that modes of behaviour other than the above, like casual contacts, shaking hands, sharing food, hugging, normal kissing (without saliva exchange or bleeding), socializing, school setting, office setting, saliva exchange or bleeding), socializing, school setting, office setting, sharing toilets or swimming pools, etc... can transmit the virus. These modes are well studied and give us a clue as to how to avoid the spread of the infection. Yes, it is an easily *preventable* infection. It is paradoxical to imagine that such a devastating virus can easily be halted because of its low contagious potentiality!

ECHO: What are the co-factors in the development of AIDS?

Current research is devoted to the role of the cofactors in this disease. It has been well documented that about 10-30% of the infected individuals may progress to full blown AIDS due to the



Number of AIDS cases reported to the World Health Organization (WHO) in each year from 1979 to 1988 is shown. The 1988 data, indicated by dashed lines, are projections. The Americas dominate the number of reported cases in part because of high reporting efficiency, which perhaps approaches 90 percent. The total-cases curve exhibits nearly exponential growth, with a doubling time of slightly over a year. This striking rate of increase is due not only to an actual increase in the number of AIDS cases but also to improved surveillance. The cumulative total as of August 1 was 108,176. Underreporting is still a problem in many parts of the world, however, and the WHO estimates that the true total was actually close to 250,000.

Scientific American, October 1988.

The global epidemic has produced three response patterns.

Pattern I (North America, Western Europe, Australia, New Zealand, parts of Latin America)

70-80% Homosexual or heterosexual males and females (with males predominating); intravenous drug users.

2-3% Heterosexual transmission.

Pattern II (Africa, Caribbean countries)

15% Among sexually active people.

Males/females, seroprevalence.

Mostly heterosexuals. Drug injecting behaviours almost nil.

Pattern III (Asia, North Africa, Eastern Europe, Eastern Mediterranean)

3% Hetero- and homosexuals.

Less than 1% drug injecting.

destruction of the immune system.

Other 'opportunistic infections' might develop like pneumonia and certain types of cancer. It is through these secondary infections caused by the opportunity of the low resistance in the host that the AIDS patient suffers from. There are certain other diseases that predispose an infected person to acquire this progression, like other sexually transmitted diseases (syphilis, gonorrhoea, chancroid, genital herpes), cancers, massive long standing diarrhoea, long standing untreated tuberculosis, etc. In fact any severe infection may activate the dormant HIV virus. The current advice given by experts is that if a person is infected, he should get all infections treated in a timely manner so as to avoid stimulation of the viral replication. This area of research is not yet completely explored and much work is going on at present.

ECHO: Should people take any special precautions in their everyday life, in particular in their contacts with an 'infected' colleague?

The answer is a clear 'NO!' The modes of transmission are well known. (See box). There is no transmission through casual contacts in an office setting or a social setting. Studies have been made among family members of AIDS patients who were in close association with them and found not to be infected! They even kissed good night every day. ILO and WHO and other national institutions studied this question in detail and came to the conclusion that an infected person in an office poses no threat to his/her colleagues or outside the

office, and therefore no restriction or stigma be attached. Fiction and gossip, rather than facts, have produced these effects.

ECHO: What progress is being made in the development of preventive and curative measures like vaccines and/or medicines?

A few years ago, virologists considered the AIDS virus to be a simple one, so we believed quite naively that an effective vaccine could be produced rather quickly. In fact famous virological centres in the world are competing towards achieving this objective. Let us mention in particular the pioneering work carried out at the National Institute of Health (Bethesda, USA) where Dr Gallo was a co-discoverer of the AIDS virus, at the Pasteur Institute in Paris where Barre Sinussi and Luc Montagnier isolated this virus in 1983, in Sweden, in the UK, in the German Federal Republic, here in Austria, in India and some other Asian countries.

It soon became clear however that the virus is quite complex in its behaviour. One interesting observation is that it changes its outer coat protein sequences very fast (about 1000 times in a few minutes) which implicates a correspondingly rapid variation of its antigenic potential, provoking equally changing antibody responses. In order to effectively counteract the AIDS virus' antigenic potential, the antibody system of the host should also change in the same speed. But the

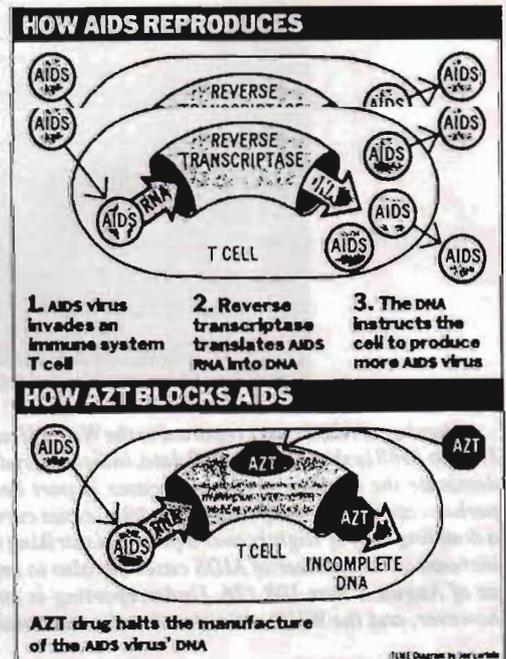
body's defence system consisting of lymphocytes is not able to cope with this challenge, leaving the body cells defenseless against the changing tactics of the virus. Furthermore, as I have mentioned earlier, the AIDS virus destroys the very cells (lymphocytes T group) which are commissioned to fight against it.

A vaccine which is intended to evoke a counterpart antibody response to fit exactly onto the antigen may therefore not be possible, simply because the antibody once produced will not be effective against the next altered antigen. Only a vaccine which is able to evoke a combination of antibody series to cover all forms of the changing antigenic potentials will be theoretically capable of protecting the body against the virus.

This may be compared to the current flu epidemics due to the changing coat of the flu virus itself, producing 'different' types of flu infections in a defenseless individual, in spite of flu vaccination. To make it more desperate, the antibody which is intended to neutralize the AIDS virus does not achieve this effect, leaving the virus intact, thus able to cause disease.

The situation is further complicated by the discovery in 1986 of a second AIDS-causing virus now called HIV-II.

In spite of all these failures stupendous advances have been made in a short time along the way of producing a dependable vaccine. Optimistic scientists believe that an effective vaccine against the AIDS virus will be produced within the next 10 years.



Remarkable progress has also been made towards drug approaches to contain the virus. At least 12 of them have been tried out, of which Zidovudine (AZT) has been shown to suppress the reverse transcriptase enzyme which is known to facilitate virus replication and some of the AIDS symptoms have been favourably influenced. These drugs have however shown some side effects which restrict their free use. It is too early to tell if they are effective and safe. The drug satisfying all criteria is still to be found.

ECHO: If effective vaccination against or cure for this disease is not in sight in the immediate future, what are the other preventive measures against the spread of this virus? How efficient are condoms?

For the present, the only protection against AIDS is through education and awareness. As you know, 'prevention is always better than cure'. So long as curative drugs or effective vaccination is not in sight, the only way to halt the spread of the virus is to influence the mode of transmission. Fortunately, the modes of transmission and non-transmission are well known (see box).

It all boils down to adopting safe behaviour patterns and avoiding risk behaviour patterns which are clearly identifiable. In order to promote these patterns and avoid the risky ones, education, education and education are the only answer. This should be an ongoing programme. Dissemination of proper information regarding modes of transmission, physiological implications and hazardous activities will make it easier for the individual to accept and abide by these patterns. Then again, this whole process should be implemented at all levels: personal, social, national, whole process should be implemented at all levels: personal, social, national, international, governmental and non-governmental. Since it is a global issue, only worldwide efforts will stop it.

This imposes on everybody a change in life patterns, a conversion of high risk behaviours to low risk ones — avoiding promiscuity, opting for monogamy with a known, healthy partner, avoiding casual sex (sex tourism,...), using a barrier protection like a condom (from start to finish) or oil-based protective devices including virucides. These measures would go a long way in stopping the spread of the virus.

Well selected condoms are highly protective; a hundred percent protection

can, of course, be never guaranteed.

ECHO: What conclusive statement would you make on the AIDS situation?

Summing up, I may say that we are facing a challenge of extreme urgency, a scourge the world has never confronted before, the spread of a tiny, incomplete micro-organism whose changing tactics ruthlessly destroy the human immunodefence system. This can be stopped only by modifying our risk behaviour patterns, all of which are identifiable and well recognized.

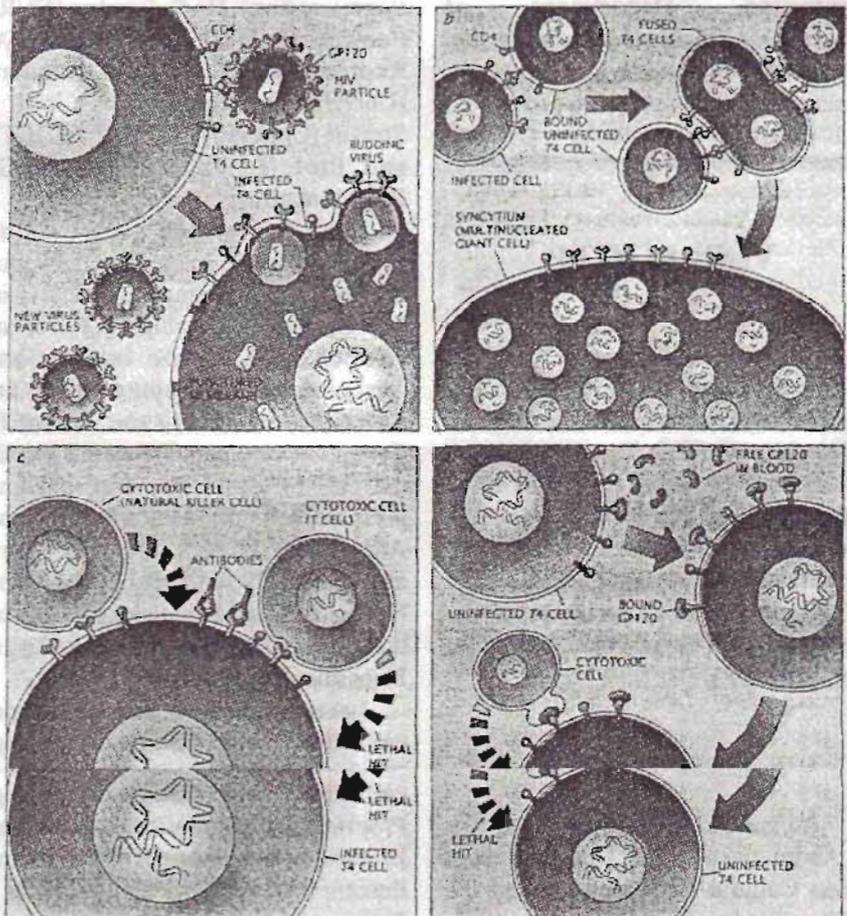
On the other hand, it is a preventable disease. If neglected, however, its exponential explosion may affect in particular younger age groups irrespective of sex or race, causing in the

future generation gaps in the age groups 45-50, breaking down the massive public health schemes, devastating parts of the continents and causing populations with dementia.

This virus knows no geographical boundaries, therefore only a worldwide mobilization of efforts will stop it, at personal, national, governmental and international levels.

In spite of all this, it is a fragile virus which can be easily controlled. It all lies in the risk behaviour patterns one has to modify.

I hope that, in spite of the unavoidable medical concepts involved in my explanations, the main points were clearly conveyed.



Destruction of T4 cells, which are critical to immune defense, is the major cause of the progressive immune dysfunction that is the hallmark of HIV infection. The virus is known to kill cells by replicating, budding from them and damaging the cell membrane (a). HIV might also kill T4 cells indirectly, by means of a viral protein, gp120, that is displayed on an infected cell's surface. A molecule on T4 cells — the CD4 receptor — has a strong affinity for gp120, and healthy T4 cells can bind to the gp120 and merge with the infected cell (b). The end result, called a syncytium, cannot survive, and all the once healthy cells it contains are destroyed along with the infected cell. HIV can also elicit normal cellular immune defenses against infected cells (c). With or without the help of antibodies, cytotoxic defensive cells can destroy an infected cell that displays viral proteins on its surface. Finally, free gp120 may circulate in the blood of people with HIV (d). The free protein may bind to the CD4 receptor of uninfected cells, making them appear to be infected and evoking an immune response.

Scientific American, October 1988.

Salam Prize in Science 1991 in Mathematics

Applications/nominations are hereby invited for Salam's Prize in Science for Mathematics for the year 1991. Candidates must be Pakistani citizens normally resident in Pakistan, preferably below 35 years of age on December 31, 1991. The entire research and/or a special technical paper will be considered for the Prize.

Candidates should send 4 copies of their complete bio-datas with the material to be evaluated, to Dr. Asghar Qadir, Secretary, Salam Prize Committee, Department of Mathematics, Quaid-i-Azam University, Islamabad, Pakistan. ♦

Visits to ICTP

EEC Fellows

A group of students from the Romanian Universities under the fellowship of EEC Tempus Scheme visited the ICTP on 2nd December 1991. Before touring the premises and the laboratories, they had an interaction with the Scientific Information Officer about the activities and programmes of the International Centre for Theoretical Physics (ICTP).

Italian Cultural Institutions

About twenty-five Directors from Italian Cultural Institutions visited the ICTP on Wednesday 11 December 1991. On the occasion, the Deputy Director of the ICTP and Director of SISSA and Prof. Forti, Prof. Hassan and Prof. Denardo delivered a brief talk about the activities of the ICTP and TWAS, ICS and SISSA.

After the meeting, the guests visited the laboratories and Library of the International Centre for Theoretical Physics (ICTP). ♦

Activities at ICTP November/December 1991

Title: CONFERENCE ON MAJOR PROBLEMS OF THE ATMOSPHERIC SYSTEM AND THE DEVELOPING COUNTRIES, 11 - 15 November.

Directors: Professors G. Furlan (University of Trieste and ICTP) and S.M. Radicella (International Institute for Earth, Environmental and Marine Sciences and Technologies, IIEM, Trieste, Italy).

Programme Committee (Organizing Committee): Dr. J.L. Fellous (CNES, France), Dr. M. Geller (SCOSTEP Representative), Dr. R. Gendrin (CNRS, France), Prof. K. Labizke (IAMAP Representative), Prof. J. Roederer (University of Alaska, USA), Prof. F. Stravisi (University of Trieste and ICTP) and Prof. J. Taubenheim (IAGA Representative).

The Conference was mainly supported by the International Institute for Earth, Environmental and Marine Sciences and Technologies (IIEM) and co-sponsored by the International Association of Geomagnetism and Aeronomy (IAGA), the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) and the International Association of Meteorology and Atmospheric Physics (IAMAP). It was also financially supported by the Centre National d'Etudes Spatiales (CNES) and the Centre National de la Recherche Scientifique (CNRS) of France.

Lectures: WMO and developing countries. Solar Terrestrial Energy Programme. International Geosphere Biosphere Programme. International Equatorial Electrojet Year. Activities in Trieste. Variability of solar energy input. Response of the atmospheric system to solar energy variability. Ozone variability. Global atmospheric electricity. Dynamic coupling and middle atmosphere response to forcing from above and below. Ionospheric modelling and ionospheric irregularities. Ionospheric variability effects on telecommunications. Waves and tides in the ionosphere. Magnetospheric dynamics. Solar particle variability and geomagnetic storms effects.

Reports of activities in developing countries.

The Conference was attended by 54 lecturers and participants (41 from developing countries).

Title: SCHOOL ON MATERIALS FOR ELECTRONICS: GROWTH, PROPERTIES AND APPLICATIONS, 18 November - 6 December.

Organizers: Professors A. Baldereschi (University of Trieste, Italy and Ecole Polytechnique Fédérale, EPF, Lausanne, Switzerland), J.C. Maan (Hochfeld-Magnet Lab., Max-Planck-Institut für Festkörperforschung, Grenoble, France) and C. Paorici (University of Parma and Istituto materiali speciali per l'elettronica e magnetismo, MASPEC-CNR Laboratory, Parma, Italy).

The School was organized by the ICTP and the International Centre for Science and High Technology (ICS), in collaboration with the Commission on Crystal Growth and Characterization of Materials of the International Union of Crystallography, and the Consorzio Interuniversitario Nazionale per la fisica della materia, INFN.

Lectures: Atomistic mechanisms of crystal growth and epitaxy. Chemical vapour deposition: fundamentals; vapour phase epitaxy; metal-organic vapour phase epitaxy. Growth modelling. Growth phenomenology, modelling. Growth phenomenology. Liquid phase epitaxy. Melt growth of semiconductors. Molecular beam epitaxy. Quantum dots on semiconductors. Materials for nonlinear optics. Ultrafast dynamics of quantum wells by time resolved luminescence. Metal-organic molecular beam epitaxy. Quantum structures by MBE. Local probes of semiconductor interfaces. Microscopic theory of heterostructures: electronic properties. Materials characterization by transmission electron microscopy. Effective-mass theory of quantum structures. Optical properties of epitaxial films and quantum structures. Simulation of semiconductor



School on materials for electronics: growth, properties and applications, 18 November – 6 December.

device performance. Microscopic theory of heterostructures: lattice dynamical properties. Structural study of heterostructures by X-ray diffraction. Growth of shaped crystals. Microscopy and spectromicroscopy of heterostructures by STM. Atom deposition by STM. Physics of resonant tunnelling: high magnetic field and optical studies. Electronic properties of the two-dimensional electron gas in high magnetic fields. Amorphous semiconductor interfaces and multilayer structures. Ion beam writing of small structures. Fundamental optical properties of heterostructures. Microscopic control AlAs/GaAs heterostructures. Heterostructure and quantum electronic devices. Classical and quantum transport in mesoscopic systems. Electronic and optical properties of ultra-narrow GaAs/AlAs and InAs/GaAs quantum wells down to the monolayer limit. Optoelectronic devices. Planar technology.

Seminars: Crystal growth activities at the Crystal Growth Centre, Anna University, Madras, India. Laser-assisted deposition of Pb chalcogenide films. Optical characterization of PbO films. Theoretical aspects of crystal growth. MBE in China. Characterization of Sn-Dx centers in LPE-grown AlGaAs:Sn. Investigation of mismatch behaviour between epitaxial layer and the substrate in LPE InGaAsP:InP system. The characterization of strained-layer superlattice by TEM and CBED (convergent-beam electron diffraction).

Monolayer island formation in narrow InAs/InP single quantum well. Effects of ion implantation on the corrugation periodicity of highly oriented pyrolytic graphite. Light absorption by excitons and biexcitons in quantum wells; influence of a resonant electromagnetic field. Two-dimensional plasmon dispersion in semiconductor-dielectric structure with metal grating: strict theory. Growth and characterization of surface emitting lasers. GaAs/GaAlAs travelling-wave laser amplifier with tilted facet.

Visits to: TASC-INFM Laboratory (Trieste). ICTP Superconductivity Laboratory. ICTP Laser Laboratory. ICTP Microprocessor Laboratory.

The School was attended by 101 lecturers and participants (52 from developing countries).

Title: SECOND INTERNATIONAL WORKSHOP ON RADON MONITORING IN RADIOPROTECTION, ENVIRONMENTAL AND/OR EARTH SCIENCES, 25 November – 6 December.

Organizers: Professors G. Furlan (University of Trieste and ICTP), Shi-Lun Guo (Institute of Atomic Energy, Beijing, P.R. China), F. Steinhäuser (University of Salzburg, Austria), N. Sultankhodjaef (Academy of Sciences of the USSR, Tashkent, USSR) and L. Tommasino (Comitato nazionale per la ricerca e per lo sviluppo dell'energia nucleare e delle energie alternative, ENEA, Rome, Italy), with the co-sponsorship of ENEA and the Regione Friuli Venezia-Giulia, Italy.

Lectures: The European radon programme. Natural environmental radioactivity with particular regard to radon gas and cosmic rays. Present and future radioprotection recommendations within the European Community with special regard to radon. A view of experimental radon-induced effects in animals. Review of the latest findings of population exposed to high background natural radioactivity. The Italian National Survey of radon: sampling strategy, realization and follow-up. The regional survey of indoor radon in Friuli Venezia-Giulia (Italy). Radon monitoring in dwellings and in water in



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localized areas of Friuli Venezia-Giulia. Radon measurements in kindergartens of Osijek. Measurements of environmental radon concentrations in Trieste houses. Radon monitoring by passive detectors. The assessment of the indoor gamma exposures in the Italian national survey. Unique experiences in the Italian National Survey run by several different regional laboratories. Radon measurements in the Gran Sasso underground laboratory. High natural radiation areas with special regard to Ramsar. Indoor radon concentration measurements in one high natural radiation area of Italy. Detailed radon emanation mapping in northern Latium (Italy). Nuclear track filters and applications to aerosol sampling. Active monitoring of radon and radon daughters. Indoor and outdoor radon survey in Slovenia. Comparison of different radon calibration chambers. Monitoring of radon in occupied and residential environments in Central Ghana. Measurements of radon at a hospital tunnel system. Summary of indoor radon research results by using nuclear track detectors. Radon studies in Siwalik Himalayas, India. Radioprotection problems of man-made versus natural radioactivity. Environmental behaviour of artificial radionuclides. The search for radon sources: a multidisciplinary task. Natural radioactivity and dating. Fractal analysis of radon indoor time-series. The determination of U and Th concentrations in soils and building

materials. Models for interpreting the deposition measurements for Rn222 and Rn220 daughters. Single-event upsets in microelectronics and the correspondent radiation effects in biological systems. applications of PIN diode for radon emanation studies. The use of silicon devices (diodes, RAMs etc.) for alpha particle detection. Ionizing particle detection by charged couples devices. Real-time monitoring by silicon photodiodes. Long-term radon studies at the Thermalkarst region of Budapest. A new radon monitor system – MEGARAD. Experiences accumulated on radon monitoring for earthquake prediction. Radon in spring water as a seismic precursor. Radon monitoring for the prediction of mine outbursts. Selected problems in radon measurements. Radon measurements for earthquake prediction and location of geological faults in Pakistan. Prospects and potentials of radon monitoring in North-Eastern India. Dependence of radon anomaly from seismicity and other parameters in Bad Brambach. Radon monitoring for the study of the fractured aquifers. Investigation of radon sub-soil in the USSR. Radon monitoring for earthquake prediction at the Guru Nanak Dev University. Analysis of electrical phenomena as earthquake precursors. Radon emanation and earth-time movements. Geochemistry applied to volcanic surveillance. Extraterrestrial induced multi-years cyclicities in geophysical, geochemical and biological parameters. The importance of the

comparative study of rare gases in earth science. Radon geochemistry and geophysics in deep fluids in Italy. Reading techniques of solid state and nuclear track detectors. Evaluation of the registration efficiency of the radon diffusion chambers. Mineral exploration based on radon measurements. Radon emission versus meteorological parameters. Comparison between neutron induced and photon induced fission for measuring actinides. New trends in radioprotection and environmental monitoring.

The Workshop was attended by 100 lecturers and participants (41 from developing countries).

Title: WORKSHOP ON NON-LINEAR DYNAMICS AND EARTHQUAKE PREDICTION, 25 November – 13 December.

Organizers: Professors V.I. Keilis-Borok (International Institute for the Theory of Earthquake Prediction and Mathematical Geophysics, Academy of Sciences of the USSR, Moscow, USSR) and G.F. Panza (Institute of Geodesy and Geophysics, University of Trieste, Italy).

The Workshop was organized in collaboration with the International Centre for Science and High Technology (ICS, Trieste) and the Institute of Geodesy and Geophysics of the University of Trieste.

Lectures: Analysis of earthquake catalogs. Introduction to the IEPT software for analysis of earthquake catalogs. Functions on earthquake flow. Premonitory activation of seismicity: the M8 algorithm. Pattern recognition: general description. Evaluation of the M8 algorithm. Source tensor retrieval for general description. Evaluation of the M8 algorithm. Source tensor retrieval for small events. Earthquake prediction based on dynamical system approaches. Pattern recognition in earthquake prediction. Data on radon in the framework of earthquake prediction problem. What can be done in practice with intermediate term prediction. What is done in the U.S. Nonlinear dynamics of lithosphere and earthquake prediction. Intermediate-term earthquake prediction: algorithm CN. Integral approach in the study of solid earth: problems of seismic risk and earth structure. Global monitoring of seismicity aimed at intermediate-term prediction of the strongest earthquakes. Statistical



Workshop on nonlinear dynamics and earthquake prediction, 25 November – 13 December.

mechanics of earthquake. Application of CN algorithm to Central Italy. The physical basis for modelling of seismicity. The motion of interfaces, fronts of fractures. Earthquake dynamics. Movable disks: model of seismicity. A possibility to narrow down

spatial uncertainty of intermediate-term earthquake prediction: the "Mendocino Scenario". Seismic response of sedimentary valleys. Site effects for microzonation studies.

Computer Exercises: Analysis of earthquake catalogs. Functions on

earthquake flow. The M8 algorithm. Pattern recognition in earthquake prediction. Algorithm CN.

The Workshop was attended by 58 lecturers and participants (31 from developing countries). ♦

Calendar of Activities at ICTP in 1992

- Adriatico Research Conference on polarization dynamics in nuclear and particle physics 7 – 10 January
- Third Training College on physics and technology of lasers and optical fibres 27 January – 21 February
- Workshop on computation and analysis of nuclear data relevant
to nuclear energy and safety 10 February – 13 March
- Topical Workshop on coherent atom-radiation interactions 24 February – 6 March
- College on neurophysics — Object recognition by man and machine 2 – 27 March
- Spring School on string theory and quantum gravity 30 March – 7 April
- Workshop on string theory 8 – 10 April
- Workshop on computer networks 30 March – 17 April
- Workshop and Conference on "Global change and environmental considerations
for energy systems development" 21 April – 8 May
- The essential role of science in technological progress and economic development 22 – 24 April
- Spring College on superconductivity 27 April – 19 June
- Experimental Workshop on high T_c superconductivity (advanced activities) 27 April – 19 June
- ICS/ICTP/WMO International Workshop on Mediterranean cyclones studies 18 – 22 May
- Trieste Workshop on the search for new elementary particles: status and prospects 20 – 22 May
- Trieste Workshop on the search for new elementary particles: status and prospects 20 – 22 May
- School on dynamical systems 25 May – 5 June
- Seventh Trieste Semiconductor Symposium on: "Wide-band gap semiconductors" 8 – 12 June
- Workshop on dynamical systems 8 – 19 June
- Miniworkshop on strongly correlated electron systems IV 15 June – 10 July
- Summer School on high energy physics and cosmology 15 June – 31 July
- Research Workshop in condensed matter, atomic and molecular physics 22 June – 11 September
- Adriatico Research Conference on clusters and Fullerenes 23 – 26 June
- Miniworkshop on non-linearity: dynamics and surfaces in nonlinear physics 13 – 24 July

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Calendar of Activities at ICTP in 1992, contd.

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 in 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

Second Workshop on the applications of synchrotron radiation 2 – 27 November

Third Workshop on basic VLSI design techniques 2 – 27 November

Workshop on three-dimensional modelling of seismic waves generation,
propagation and their inversion 30 November – 11 December

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

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