American Association for the Advancement of Science

SCIENCE

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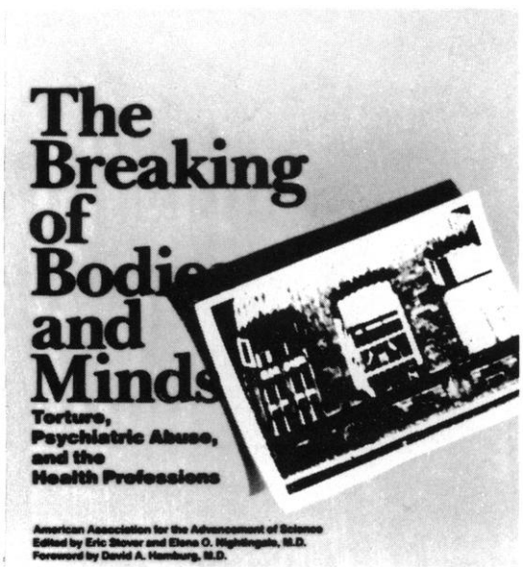
The Breaking of Bodies and Minds

Torture, Psychiatric Abuse, and the Health Professions

A documentation of systematic use and effects of physical and mental torture throughout the world

Edited by Eric Stover
and Elena O. Nightingale
With a Foreword by
David A. Hamburg



This eye-opening book brings together for the first time writings on the role of medical personnel in cases of torture and psychiatric abuse. Through analyses and case histories, psychiatrists and other health care professionals, political scientists, ethicists, and other writers discuss the systematic use and effects of physical and mental torture in the Soviet Union, Latin America, and other parts of the world.

The book also details the complicity of an alarming number of medical personnel in torture and psychiatric abuse and examines the ways in which governments use a medical rationale to seek legitimacy for human destruction. Finally, it describes efforts by medical and other associations both to combat offensive practices and treat victims.

Contents

The Breaking of Bodies and Minds is important reading for anyone concerned with the preservation of basic human rights.

1985 352 pages

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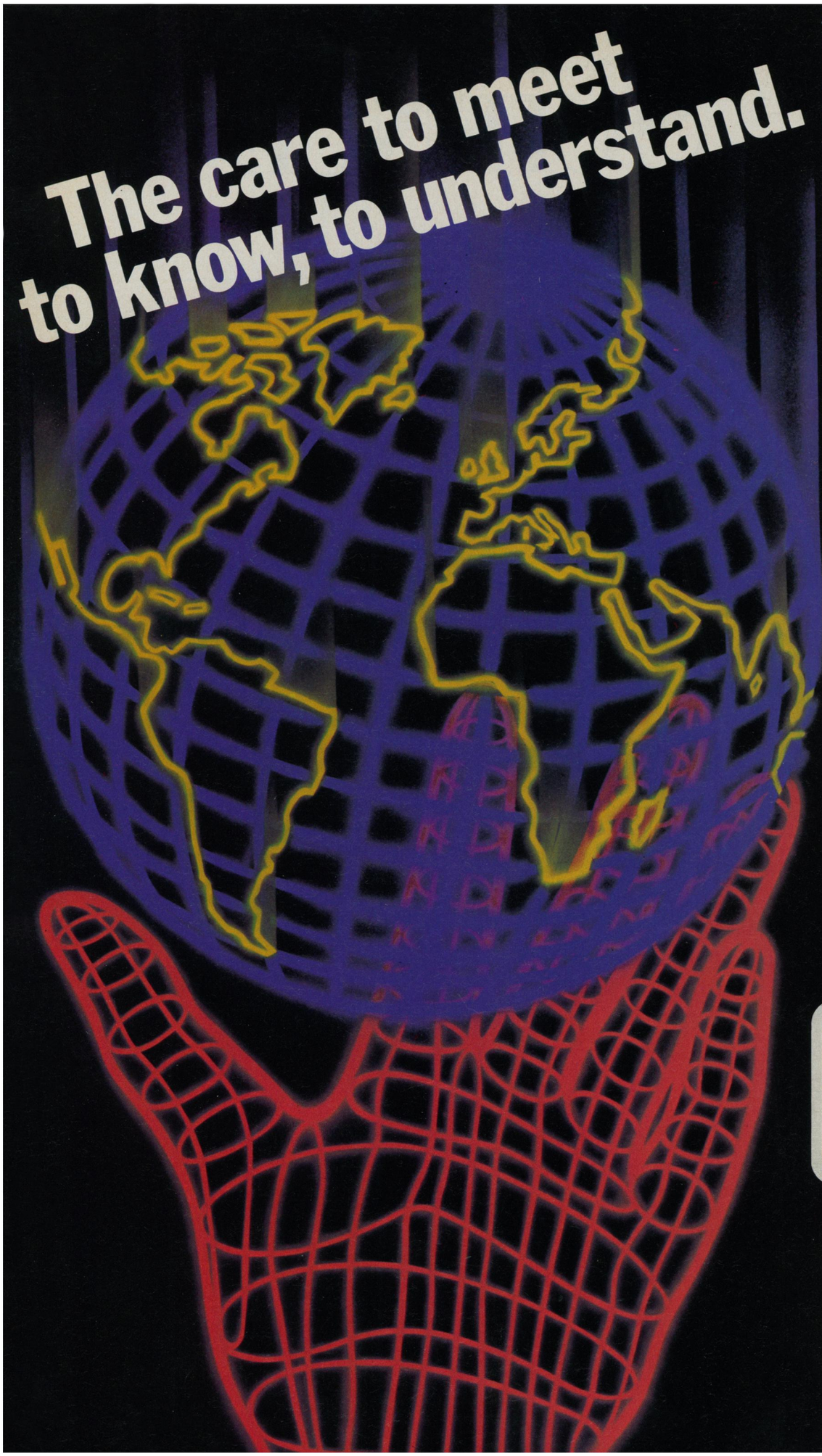

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Scientific Organization: M. Parvinen (SF)

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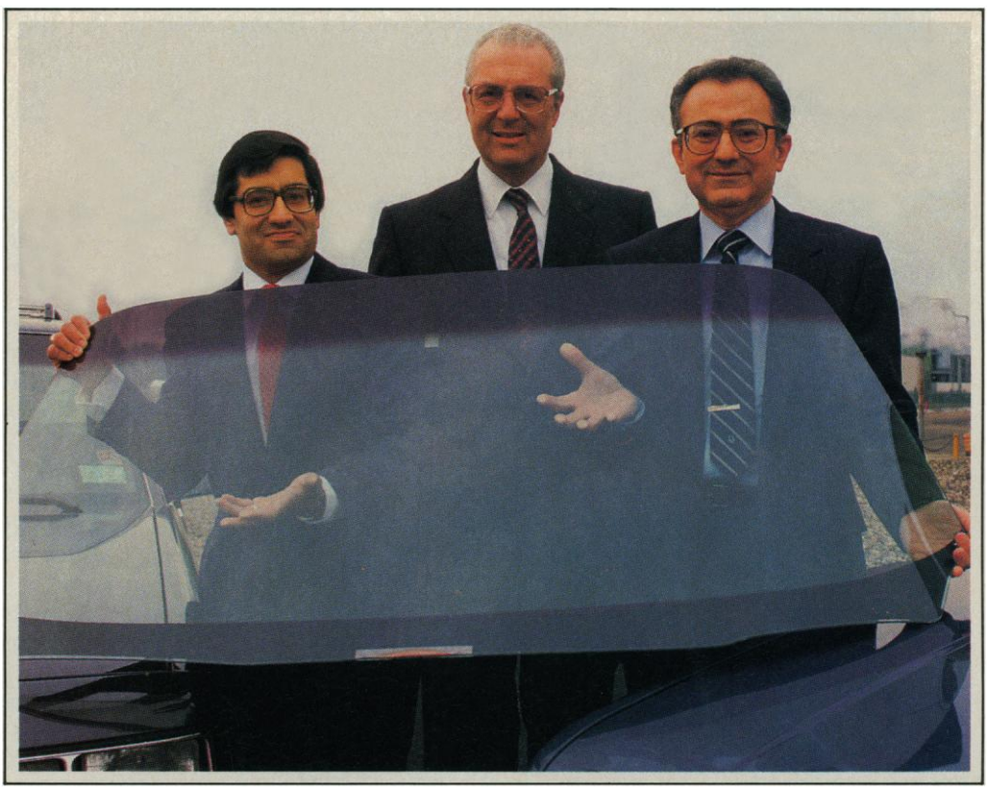
■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER Enhanced color image of Central Valles Marineris, Mars, where the suspected recent volcanism occurred. The photograph is a composite of high-resolution images in black and white and low-resolution images in color. Some of the dark material covering the Valles Marineris floor in the image is the material that may have come from volcanic vents and was dispersed by the wind. See page 565. [Alfred S. McEwen, U.S. Geological Survey, Flagstaff, AZ 86001]

Book Reviews

TECHNOLOGY YOU CAN SEE THROUGH



Monsanto engineers Robert Esposito, William Mumford and Jack Boyajian have won the Company's 1986 Edgar M. Queeny Award. The award honors the development of proprietary technology that leads to a commercial success, and carries an $80,000 prize and a gold medallion.

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Plan to participate in *National Science & Technology Week* '87 April 5-11, coordinated by the National Science Foundation.

This Week in
SCIENCE

Ending famine

A once inevitable web of events—starting with bad weather, war, or other civil disturbance, proceeding from these to crop failure and then to famine—can today be thwarted by judicious local and international responses (page 539). Mellor and Gavian discuss patterns of contemporary and historic famines. A number of recent serious crop failures are described that have not led to widespread starvation and death because governments in affected areas redirected agricultural production (which, in turn, promotes long-term economic development and preparedness), redistributed goods, and efficiently coordinated other relief efforts. Because serious famines do not typically issue from a single crop failure but arise after several hardship years, thoughtful governments have time to respond when signs of distress begin appearing. Modern science, too, can contribute to easing famine through the development of, for example, drought-resistant and more rapidly growing plants and crops giving greater yields per acre. Foreign aid proves most effective if it supports and complements the long-range efforts underway to deal with both the current crisis and the local conditions that are allowing it to burgeon.

Steps in fertilization

Egg and sperm units to achieve fertilization in a multi-step procedure that has both great inherent interest and interest for those concerned with manipulating the process either to achieve fertility or infertility (page 553). In mammalian systems, during the initial attachment stage, sperm encounter the egg's thick outer coat (the zona pellucida) and bind to one of its glycoprotein components. Later, the acrosome reaction occurs in the sperm head, and limited proteolysis of the zona pellucide permits sperm to advance through the layer. Fertilization requires fusion of the plasma membrane of the sperm with that of the egg and entry of sperm (along with microvilli on the egg's surface) into the egg. Thereafter, changes take place in egg constituents that prevent additional sperm from penetrating. Wassarman compares some of the molecular details of this process as it occurs in one mammal—the mouse—with those in a nonmammalian organism, the sea urchin. Despite the evolutionary distance between these species and despite the fact that fertilization occurs internally for one and externally for the other, many details of the process appear to have been conserved.

Superconductor technology: the heat is on

The temperatures at which a new series of superconductors—compounds that, at low temperatures, have zero electrical resistance—have superconducting properties are warmer than previously considered practicable (page 567). Chu *et al.* manufactured a series of alloys from lanthanum, barium, copper, and oxygen and tested their electrical properties at high pressures and low temperatures. Compounds began showing superconductivity at 52.5 K; until recently, superconductivity was never achieved above 23 K. In a Research News article, Robinson discusses the recent developments in the study of this new generation of superconductors, why raising the temperature is a major and welcome technologic feat, what atomic mechanisms might account for the activity of the new superconductors, and practical applications of superconducting materials (page 535).

DNA nick in crown gall disease

Crown gall disease is produced in plants by the tumorigenic bacterium *Agrobacterium tumefaciens* (page 587). Virulent bacteria are attracted to and infect wounded plants; galls that characterize the disease develop on plant tissues. One of the earliest molecular events that takes place in this disease is the nicking of a piece of DNA—the Ti (tumor-inducing) plasmid—in the bacteria. Wang *et al.* incubated bacteria with an inducer molecule purified from plants; within a few hours, nicks began appearing, and T-DNA (transfer-DNA) molecules were mobilized from the plasmid. A necessary and sufficient substrate for the nicking process was found to be a 25–base pair sequence at the ends of the T-DNA fragment; most nicking took place at the third or fourth base in the region, although nicking occasionally occurred at more distant sites. The nicking sets in motion this naturally occurring gene transfer process between prokaryote (bacterium) and eukaryote (plant); transfer is followed by integration of the T-DNA into the plant genome and subsequent tumor formation.

Bacteria engineered to degrade pollutants

New organic compounds—many of which are pollutants, some of which are toxic—are being developed at a faster rate than new catabolic pathways for degrading them are evolving in microrganisms (page 593). Ramos *et al.* describe an approach to restructuring a bacterial catabolic pathway so that a formerly nondegradable synthetic compound could be degraded. The TOL pathway of *Pseudomonas* degrades natural alkylbenzoates but not 4-ethylbenzoate, a related synthetic compound. Analysis of why 4-ethylbenzoate was not degraded (through studies of bacterial strains that could carry out some of the catabolic steps) indicated that crucial enzymes were not induced by the compound and that an important enzyme was inactivated by one of the metabolic products. Genes were then taken from various mutant bacterial strains and were inserted into normal bacteria. Degradation of 4-ethylbenzoate was eventually effected while the degradation of natural alkylbenzoates continued unimpaired. This use of genetic engineering for restructuring a metabolic pathway has great potential for accelerating "evolution" of such pathways so that exotic organic compounds can be catabolized.

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Lifelong Learning

At one time, a single stint of university education was sufficient to provide the structural framework for lifelong learning. It was then possible for scientists or engineers to maintain a good level of awareness about progress in much of science or engineering. But the body of knowledge is expanding rapidly, and many new specialties have arisen. In some disciplines, several hundred thousand pages in journal articles appear each year. The usual response of the individual to the flood of knowledge is to become an expert devoted to learning more and more about less and less.

Most engineers are employed in industry; there, life is increasingly turbulent as some technologies become outdated and foreign competition destroys many jobs. Even in healthy companies, older engineers find themselves obsolescent as new technologies become applicable that did not exist when they were in school. This country trains fewer engineers per capita than do our leading competitors. Both for competitive and humanitarian reasons, we cannot afford to consign older engineers to oblivion. On the basis of individual effort, it is not feasible for an engineer in mid-career to change fields or to update himself or herself extensively without some kind of structured support. Thus there is a national need to organize effective continuing education for engineers. This need has been recognized by a number of organizations, including the American Society for Engineering Education, which presents a discussion of the problem in a report on Engineering Education.*

The activities of engineers are relevant to the scientific community for several reasons. First, a large fraction of the basis for support of academic research is the assumption that practical applications will result. If there are to help better our competitive positions, our engineers must function effectively. A second reason is that if the engineers evolve good mechanisms for fostering lifelong learning, these will be applicable to scientists.

Engineers working in industry are not alone in becoming obsolescent. At equal hazard are faculties at universities, including scientists and engineers. A striking example and a useful remedy were experienced at Massachusetts Institute of Technology. In common with many other schools teaching engineering, MIT in the early 1980s received a large number of applications from high-quality students wishing to study engineering. After being admitted and on campus, many wanted to major in electrical engineering and computer science. More than half of the students wished to take a sophomore course entitled, "Structure and Interpretation of Computer Programs." This included newly developed cutting-edge material with which only a tiny fraction of the faculty was familiar. Senior faculty were faced with the indignities of knowing less about an important subject than the sophomores and being unable to do their share of teaching it. The crisis was met by a special course for faculty conducted during the January break in 1984. The course, given 8 hours a day for a week, with laboratory and homework, enabled some of the faculty to understand better a textbook on the topic and later to teach it. Other sections of the course were conducted employing a 2-week period of total immersion in the subject at a secluded spot off campus. Freed from the innumerable interruptions and distractions that occur on campus, the professors enjoyed a tremendous learning experience. Experience at MIT with courses designed especially for faculty has been satisfactory and has led to similar courses in other fields.

Some leading companies, including AT&T, GE, and IBM, are active in continuing education. They, too, use isolated campuses with total immersion for a week and more. At least one company conducts a written examination at the conclusion of the course.

Most universities have no structured program for faculty education. Individuals are expected to create their own programs, which may involve sabbaticals, attendance at professional meetings, and other traditional activities. These, though useful, are not sufficient for many professors. A national need exists to foster lifelong learning. This need demands attention and support from universities, industry, professional organizations, private foundations, and the government.—PHILIP H. ABELSON

*American Society for Engineering Education, *The Quality of Engineering Education* (Washington, DC, 1986).

mentioned by Abelson. Moreover, the competitiveness of U.S. exports is critically dependent on their prices. Because energy is a major component in the manufacture of most U.S. exports, not only would the American oil consumer lose in the oil tax scheme but the United States would essentially be exporting its higher energy costs in the form of finished products. American competitiveness in the international marketplace would diminish, and the protectionist argument gets turned on its head. Certainly, the protectionists would not argue for a tax on U.S. exports.

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Science Unfettered

Barry D. Greenberg's enlightening etymological explanation of "Mazel tov" (Letters, 14 Nov., p. 803) is indisputable if incomplete. The Babylonian Talmud teaches "Ayn Mazol L'Yisrael." The careless translator renders this: "The people of Israel have no luck." The careful student correctly translates: "The people of Israel have no constellation," meaning that they are not idol worshippers—not even of heavenly idols. Here then, a harbinger of science unfettered.

ELY E. PILCHIK
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Berry's Phase: Other Observations

One of the fascinations of physics is the frequent appearance of the same idea in widely divergent subdisciplines. A beautiful example is Berry's phase (Research News, 24 Oct., p. 424) with import for the quantum Hall effect, gauge theories, molecular physics, and optical physics. An unfortunate consequence of the diversity is that followers of one discipline may be unaware of closely related work in another.

Not only were the fractional pseudorotational quantum numbers associated with Berry's phase predicted by Longuet-Higgins in 1958 (*1*), but consequences of fractional quantization were observed within a few years of that prediction in experiments on color centers in alkali halides (*2, 3*). More extensive results were reported on transition metal impurities in a variety of hosts during the late 1960s and 1970s (*4*). The color center work (*2*) involved optical studies of the R center, a cluster of three F centers forming an equilateral triangle. The F center, an electron trapped by the positive charge associated with an anion vacancy in an ionic crystal, is a solid-state analog of the hydrogen atom. The R center is thus the solid-state analog of the H_3 molecule; it is amusing that Na_3, another analog of H_3, was the free molecule in which Delacrétaz *et al.* (*5*) established the fractional quantization in the experiment discussed in the Research News article.

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Department of Physics, Cornell University, Ithaca, NY 14853-2501

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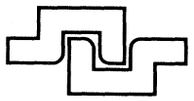
NATO International Scientific Exchange Programmes



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Those wishing to organize and direct an ASI or an ARW, or participate in collaborative research should write for information and application forms to :

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1987
Programme of meetings

The Advanced Study Institutes and Advanced Research Workshops to be held in 1987 are given in the following pages.

Participation or tuition fees are not usually requested from participants, some of whom may obtain small grants from the meeting director to assist with travel and living expenses. The meetings marked ● are of particular industrial interest. Locations and dates may change. Titles and addresses have been abridged. Many meetings are of an interdisciplinary nature : please check all subject areas. **Each meeting is held under the responsibility of its director, to whom all requests for information, attendance or support should be addressed.**

In addition to the general Advanced Study Institutes and Advanced Research Workshops Programmes, NATO supports these types of meeting as part of a special effort in Global Transport Mechanisms (GTM), Selective Activation of Molecules (SAM), Cell to Cell Signals in Plants and Animals (C-CS), Sensory Systems for Robotic Control (Rob), and Condensed Systems of Low Dimensionality (CSLD).

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Advanced Study Institutes

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Prof. E DE CLERCQ, Rega Inst. K.U.L., Minderbroederstr. 10, 3000 Leuven, Belgium
10 - 23 May 1987 : Il Ciocco, Italy 237/86

PLANT MOLECULAR BIOLOGY ●
Prof. D VON WETTSTEIN, Carlsberg Lab., Gamle Carlsberg Vej 10, 2500 Copenhagen Valby, Denmark
10 - 20 June 1987 : Valby, Denmark 281/86

NEW PERSPECTIVES IN THE DYNAMICS AND ASSEMBLY OF BIOMEMBRANES
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LE DESORDRE ET LE MELANGE
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TERRESTRIAL SPACE RADIATION AND ITS EFFECTS
Dr. PD MCCORMACK, Office of the Space Station, NASA HQ, Washington DC 20546, USA
7 - 21 October 1987 : Corfu, Greece 871/86

STUDY OF SURFACES AND INTERFACES BY ELECTRON OPTICAL TECHNIQUES
Prof. U VALDRE, Dip. di Fisica, via Imerio 46, 40126 Bologna, Italy
4 - 15 April 1987 : Erice, Sicily, Italy 897/86

PHYSICS, FABRICATION AND APPLICATIONS OF MULTILAYERED STRUCTURES
PHYSIQUE, FABRICATION ET APPLICATIONS DES MATERIAUX MULTICOUCHES
Dr. P DHEZ, LURE, Bat. 209D, Université Paris XI, 91405 Orsay, France
22 June - 4 July 1987 : Bandol, France (CSLD) 692/86

PHYSICS AND CHEMISTRY OF INTERCALATION COMPOUNDS
Prof. AP LEGRAND, Ecole Sup. de Physique et de Chimie Industr., 10, rue Vauquelin, 75231 Paris Cedex 05, France
10 - 19 June 1987 : Bonas, France (CSLD) 901/86

GEOPHYSICS AND ASTROPHYSICS

GEOPHYSIQUE ET ASTROPHYSIQUE

GEOCHEMISTRY OF HYDROTHERMAL ORE-FORMING PROCESSES
Prof. HL BARNES, Ore Deposits Res. Sect., Penn. State Univ. 235 Deike Bldg., Univ. Park, PA 16802, USA
7 - 23 January 1987: Madrid & Salamanca, Spain 642/84

PHYSICAL PROPERTIES AND THERMODYNAMIC BEHAVIOUR OF MINERALS
Dr. E SALJE, Dept. of Earth Sciences, Downing St., Cambridge CB2 3EQ, UK
27 July - 8 August 1987 : Cambridge, UK 251/86

GALACTIC AND EXTRAGALACTIC STAR FORMATION
Prof. RE PUDRITZ, McMaster Univ., Dept. of Physics, Hamilton, Ontario L8S 4M1, Canada
21 June - 4 July 1987 : Whistler, B.C., Canada 254/86

ASTROPHYSICAL AND LABORATORY PLASMA SPECTROSCOPY
Dr. RW McWHIRTER, Space & Astrophysics Div., Rutherford-Appleton Lab. Chilton, Didcot, Oxford, UK
14 - 25 September 1987 : St. Andrews, Scotland 594/86

HYDROODYNAMICAL PROBLEMS IN ASTROPHYSICS
PROBLEMES HYDRODYNAMIQUES EN ASTROPHYSIQUE
Mr R STORA, Division Théorique, CERN, 1211 Geneva 23, Switzerland
6 July - 7 August 1987 : Les Houches, France 595/86

FORMATION AND EVOLUTION OF LOW MASS STARS
Dr. AK DUPREE, Harvard-Smithsonian Ctr. for Astrophysics, 60 Garden Str., Cambridge, MA 02138, USA
21 September - 2 October 1987 : Viana do Castelo, Portugal 600/86

LONG-TERM DYNAMICAL BEHAVIOUR OF NATURAL AND ARTIFICIAL N-BODY SYSTEMS
Prof. AE ROY, Dept. of Astronomy, The University, Glasgow G12 8QQ, UK
2 August - 13 August 1987 : Cortina d'Ampezzo, Italy 617/36

HOT THIN PLASMAS IN ASTROPHYSICS
Dr. R PALLAVICINI, Osservatorio Astrofisico di Arcetri, Lgo Fermi 5, 50125 Firenze, Italy
7 - 18 September 1987 : Cargese, Corsica, France 838/86

LATE QUATERNARY SEA-LEVEL CORRELATION AND APPLICATIONS
Dr. DB SCOTT, Centre for Marine Geology, Dept of Geology, Dalhousie Univ., Halifax, Nova Scotia B3H 3J5, Canada
19 - 30 July 1987 : Halifax & Bay of Fundy, Canada 872/86

THE POST-RECOMBINATION UNIVERSE
Dr. N KAISER, Institute of Astronomy, Madingley Rd., Cambridge, CB3 0HA UK
27 July - 7 August 1987 : Cambridge, UK 903/86

MATHEMATICS — *MATHEMATIQUES*

INCOMPLETE INFORMATION AND BOUNDED RATIONALITY DECISION MODELS
Dr. HW KUHN, Dept. of Mathematics, Princeton Univ., Princeton, NJ 08544, USA
3 - 13 June 1987 : Varenna, Italy 280/86

MATHEMATICAL MODELS FOR DECISION SUPPORT
Dr. G MITRA, Dept. of Maths & Statistics, Brunel Univ., Uxbridge, Middx. UB8 3PH, UK
26 July - 6 August 1987 : Val d'Isère, France 356/86

ALGORITHMS AND ORDER ●
Dr. I RIVAL, Dept. of Maths, The University, 2500 University Drive N.W., Calgary, Alberta T2N 1N4, Canada
9 - 22 May 1987 : Ottawa, Canada 605/86

MATHEMATICAL AND STATISTICAL DEVELOPMENTS OF EVOLUTIONARY THEORY
DEVELOPPEMENTS MATHEMATIQUES ET STATISTIQUES DE LA THEORIE DE L'EVOLUTION
Prof. A DAIGNEAULT, Dép. de Maths, Univ. de Montréal, C.P. 6128, Succ. A, Montréal, P.Q. H3C 3J7 Canada
3 - 21 August 1987 : Montréal, Canada 839/86

INFORMATICS — *INFORMATIQUE*

MULTIPLE CRITERIA DECISION MAKING AND RISK ANALYSIS USING MICROCOMPUTERS
Dr. B KARPAK, Fac. of Business Admin., Istanbul Univ., Rumelihisariustu, Istanbul, Turkey
28 June - 8 July 1987 : Tarabya, Istanbul, Turkey 671/85

THEORETICAL FOUNDATIONS OF COMPUTER GRAPHICS AND CAD ●
Dr. RA EARNSHAW, Ctr. for Computer Studies, Univ. of Leeds, Leeds LS2 9JT, UK
4 - 17 July 1987 : Il Ciocco, Italy 249/86

TESTING AND DIAGNOSIS OF VLSI AND ULSI ●
Dr MG SAMI, Ist. di Elettronica, Politecnico di Milano, Piazza L. da Vinci 32, 12133 Milano, Italy
29 June - 10 July 1987 : Como, Italy 618/86

RECENT ADVANCES IN INTEGRATING LINGUISTIC KNOWLEDGE SOURCES INTO SPEECH UNDERSTANDING & DIALOG SYSTEMS ●
Prof. H NIEMANN, Lehrstuhl f. Informatik 5, Martensstr. 3, 8520 Erlangen, Germany
5 - 19 July 1987 : Bad Windsheim, Germany 757/86

APPLIED SCIENCES AND ENGINEERING
SCIENCES APPLIQUEES ET INGENIERIE

ELECTROMAGNETIC MODELLING AND MEASUREMENTS FOR ANALYSIS AND SYNTHESIS PROBLEMS ●
Dr. JK SKWIRZYNSKI, Marconi Res. Ctr., W. Hanningfield Rd., Great Baddow, Chelmsford CM2 8HN, UK
3 - 14 August 1987 : Il Ciocco, Tuscany, Italy 001/86

INSTRUMENTATION FOR COMBUSTION AND FLOW IN ENGINES ●
Pr. DFG DURAO, Mechanical Engin. Dept., I.S.T., Av. Rovisco Pais, 1096 Lisbon Codex, Portugal
14 - 25 September 1987 : Vimeiro, Portugal 235/86

THERMAL-HYDRAULIC FUNDAMENTALS AND DESIGN OF TWO-PHASE FLOW HEAT EXCHANGES ●
Prof. S KAKAÇ Dept. of Mechanical Eng., Univ. of Miami, Coral Gables, FL 33124, USA
6 - 17 July 1987 : Porto Novo, Portugal 258/86

NUCLEAR PHYSICS APPLICATIONS ON MATERIAL SCIENCE
Dr. J CARVALHO SOARES, Ctro de Fisica Nuclear, Av. Prof. Gama Pinto, 2, 1699 Lisboa Codex, Portugal
6 - 18 September : Viana do Castelo, Protugal 299/86

MATERIALS MODIFICATION BY HIGH-FLUENCE ION BEAMS ●
Dr. R KELLY, IBM Research Center, Yorktown Heights, NY 10598, USA
24 August - 4 September 1987 : Viana do Castelo, Portugal 357/86

CRYSTAL GROWTH IN SCIENCE AND TECHNOLOGY ●
CROISSANCE DES CRISTAUX EN SCIENCE ET TECHNOLOGIE ○
Prof. H AREND, Lab. Solid State Physics, Swiss Fed. Inst. of Technology, 8093 Zurich, Switzerland
27 August - 7 September 1987 : Erice, Italy 381/86

ADVANCES IN FOULING SCIENCE AND TECHNOLOGY ●
Dr. LM FERREIRA DE MELO, Dept. of Chemical Eng., Univ. of Minho, Av. Joao XXI, 4700 Braga, Portugal
18 - 30 May 1987 : Alvor, Algarve, Portugal 589/86

NEW TRENDS AND APPLICATION OF PHOTOCATALYSIS AND PHOTOELECTROCHEMISTRY FOR ENVIRONMENT PROBLEMS ●
Prof. M SCHIAVELLO, Ist. di Ingegneria Chimica, Univ. di Palermo, V. dell Scienze, 90128 Palermo, Italy
6 - 18 September 1987 : Cefalu, Italy 591/86

GEOTHERMAL RESERVOIR ENGINEERING
Prof. E OKANDAN, Petroleum & Engineering Dept., Middle East Techn. Univ., Ankara, Turkey
1 - 10 July 1987 : Antalya, Turkey 615/86

THE APPLICATION OF ADVANCED COMPUTING CONCEPTS AND TECHNIQUES IN CONTROL ENGINEERING ●
Dr. MJ DENHAM, School of Computing, Kingston Polytechnic, Kingston upon Thames, Surrey, KT1 2EE, UK
5 - 16 October 1987 : Cetraro, Italy 619/86

COMPUTER INTEGRATED MANUFACTURING : CURRENT STATUS AND CHALLENGES ●
Prof. IB TURKSEN, Dept. of Industrial Engineering, Univ. of Toronto, Toronto, Ontario M5S 1A4 Canada
30 August - 12 September 1987 : Antalya, Turkey 758/86

ADVANCES IN BERTHING AND MOORING OF SHIPS
Prof. E BRATTELAND, Div. of Port and Ocean Engineering, Alfred Getz Vei 3, 7034 Trondheim-NTH, Norway
17 - 28 August 1987 : Trondheim, Norway 841/86

NEW TRENDS IN COAL SCIENCE ●
Prof. Y YURUM, Dept. of Chemistry, Hacettepe Univ., Beytepe, Ankara, Turkey
23 August - 4 September 1987 : Çesme, Izmir, Turkey 853/86

DEMAND-SIDE MANAGEMENT AND ELECTRICITY END-USE EFFICIENCY IN BUILDINGS ●
Dr. AT ALMEIDA, Dept. de Engenharia Electrotecn., Univ. de Coimbra, 3000 Coimbra, Portugal
July 1987 : Viana do Castelo, Portugal 870/86

1987

Advanced Research Workshops

(Attendance is usually by invitation only)

LIFE SCIENCES — *SCIENCES DE LA VIE*

RISK ANALYSIS APPROACHES FOR ENVIRONMENTAL RELEASE OF GENETICALLY-ENGINEERED ORGANISMS
Dr. J FIKSEL, Risk & Decision Systems, Teknowledge Inc., P.O.B. 10119, Palo Alto, CA 94303, USA
6 - 10 June 1987 : Maratea, Italy 858/85

GENETICS OF TRANSLATION - NEW APPROACHES ●
GENETIQUE DE LA TRADUCTION - NOUVELLES APPROCHES ●
Dr. M BOLOTIN-FUKUHARA, Génétique Moléc. Univ. Paris-Sud, Ctre d'Orsay, B. 400, 91405 Orsay Cedex, France
21 - 26 May 1987 : Aussois, France 416/86

BEHAVIOURAL ADAPTATION TO INTERTIDAL LIFE
Prof. G CHELAZZI, Dip. Biologia Animale, Univ. di Firenze, V. Romana 17, 50125 Florence, Italy
21 - 25 May 1987 : Castiglioncello (Leghorn), Italy 418/86

LIPID STORAGE DISORDERS (BIOLOGICAL AND MEDICAL ASPECTS)
DESORDRE DANS LE STOCKAGE DES LIPIDES (ASPECTS BIOLOGIQUES ET MEDICAUX)
Dr. R SALVAYRE, INSERM, Unité 101 et Lab. de Biochimie, CHU Pwpar, 31059 Toulouse, France
September 1987 : Toulouse, France 585/86

CELLULAR AND MOLECULAR ASPECTS OF NEURAL DEVELOPMENT AND REGENERATION
Dr. A GORIO, Inst. of Pharmacological Sciences, via Balzaretti 9, Milano, Italy
22 - 26 May 1987 : Miami, USA 638/86

BIOPHYSICS OF ORGAN CRYOPRESERVATION
Dr. AM KAROW, Georgia Med. College, Dept. Pharma. & Toxic., 1459 Laney-Walker, Augusta, GA 30912-3368 USA
12 - 15 April 1987 : Georgia, Atlanta, USA 846/86

CELL TO CELL SIGNALS IN PLANT, ANIMAL AND MICROBIAL SYMBIOSIS
Prof. S SCANNERINI, Dip. Biologia Vegetale, Univ. di Torino, Viale Mattioli, 25, 10125 Torino Italy
19 - 22 May 1987 : Torino, Italy (C-CS) 770/84

BACTERIA, COMPLEMENT AND THE PHAGOCYTIC CELL
Dr. F CABELLO, Dept. of Microbiology & Immunology, N.Y. Med. College, Valhalla, NY 10595 USA
6 - 10 April 1987 : Maratea, Italy (C-CS) 275/86

NEUROIMMUNOMODULATION - INTERVENTIONS IN AGING AND CANCER
Dr. W PIERPAOLI, Inst. for Integrative Biomedical Res., Lohwisstr. 50, 8123 Ebmatingen, Switzerland
7 - 11 June 1987 : Stromboli, Sicily, Italy (C-CS) 397/86

MODULATION OF SYNAPTIC TRANSMISSION AND PLASTICITY IN NERVOUS SYSTEMS
Prof. H-C SPATZ, Inst. f. Biologie III der Universität, Schanzlestr. 1, 7800 Freiburg, Germany
September 1987 : Il Ciocco, Italy (C-CS) 422/86

CELL TO CELL SIGNALS IN MAMMALIAN DEVELOPMENT
Dr. SW DE LAAT, Hubrecht Lab., Int. Embryological Inst., Uppsalalaan 8, 3584 CT Utrecht, Netherlands
24 - 29 May 1987 : Il Ciocco, Italy (C-CS) 463/86

CELLULAR AND MOLECULAR BASIS OF NEURONAL SIGNALLING
Prof. H ZIMMERMANN, Zoologisches Inst., JW Goethe-Universität, Siesmayerstr. 70, D-6000 Frankfurt, Germany
9 - 13 September 1987 : Göttingen, Germany (C-CS) 910/86

AMINO ACID AVAILABILITY AND BRAIN FUNCTION IN HEALTH AND DISEASE
Dr. G HUETHER, MPI f. Experim. Medizin, Forschungsstelle Neurochemie, 3400 Göttingen, Germany
14 - 19 September 1987 : Göttingen, Germany (C-CS) 918/86

ECOLOGY — *ECOLOGIE*

FOREST BIOMASS FOR FIBER AND ENERGY - INTERNATIONAL EXPERIMENTS ON BIOMASS PRODUCTION AND UTILIZATION
Dr. J SANTOS PEREIRA, Dept. Florestal, I.S. de Agronomia, Tapada da Ajuda, 1399 Lisboa Codex, Portugal
6 - 10 October 1987 : Obidos, Portugal 417/86

BIOCHEMICAL & PHYSIOLOGICAL MECHANISMS ASSOCIATED WITH ENVIRONMENTAL STRESS TOLERANCE IN PLANTS
Prof. JH CHERRY, Horticulture Dept., Purdue Univ., West Lafayette, IN 47907, USA
3 - 7 August 1987 : Norwich, UK 421/86

TOWARD A THEORY ON BIOLOGICAL-PHYSICAL INTERACTIONS IN THE WORLD OCEAN
Prof. BJ ROTHSCHILD, Chesapeake Biologial Lab., Box 38, Solomons, MD 20688, USA
1 - 5 June 1987 : Les Arcs, France 581/86

LARGE-SCALE ATMOSPHERIC TRANSPORT OF NATURAL AND CONTAMINANT SUBSTANCES FROM CONTINENT TO OCEAN AND CONTINENT TO CONTINENT
Dr. AH KNAP, Bermuda Biological Research Station, Ferry Reach GE 01, Bermuda
19 - 27 September 1987 : Bermuda (GTM) 943/86

SOCIAL, BEHAVIOURAL AND POLITICAL SCIENCES
SC. SOCIALES, POLITIQUES ET DU COMPORTEMENT

CRIME AND ITS VICTIMS : INTERNATIONAL RESEARCH AND PUBLIC POLICY ISSUES
Prof. E VIANO, 2333 North Vernon ST., Arlington VA 22207, USA
May 1987 : Bari, Italy 670/85

COGNITIVE SCIENCE PERSPECTIVES ON EMOTION, MOTIVATION AND COGNITION
Dr. V HAMILTON, Dept. Psychology, Reading Univ., Bldg. 3, Earley Gate, Whiteknights, Reading RG6 2AL, UK
21 - 27 June 1987 : Il Ciocco, Italy 242/86

THE ECONOMIC ANALYSIS OF LABOUR MARKETS IN THE 1930s
Dr. TK HATTON, Dept. of Economics, Univ. of Essex, Wivenhoe Park, Colchester, Essex CO4 3SQ, UK
7 - 8 May 1987 : Cambridge, MA, USA 277/86

SUGGESTION AND SUGGESTIBILITY
Prof. P NETTER, Dept. Psychology Univ. of Giessen, Otto Behaghestr. 10, 6300 Giessen, Germany
9-12 July 1987 : Giessen, Germany 844/86

METHODS AND GOALS OF COMPARATIVE BRAIN SCIENCE
Dr. D INGLE, Dept. of Psychology, Cornell Univ., Ithaca, NY 14853-7601, USA
1-5 September 1987 : Bergen, Norway 893/86

PHYSICS AND CHEMISTRY — *PHYSIQUE ET CHIMIE*

NARROW BAND PHENOMENA - INFLUENCE OF ELECTRONS WITH BOTH BAND AND LOCALIZED CHARACTER
Prof. JC FUGGLE, Dept. Molecular Spectr., Cath. Univ. of Nijmegen, Toernooiveld, 6525 ED Nijmegen, Netherlands
31 May-5 June 1987 : Nijmegen, Netherlands 420/86

ATOMIC PHYSICS IN POSITRONS
Dr. JW HUMBERSTON, Dept. Physics & Astronomy, Univ. College, Gower St., London WC1E 6BT, UK
15-18 July 1987 : London, UK 587/86

QCD HARD HADRONIC PROCESSES
Dr. B COX, MS122, Wilson Hall, Fermi National Lab., PO Box 500, Batavia, Il 60190, USA
9-13 October 1987 : St. Croix, US Virgin Islands 847/86

ATOMIC AND MOLECULAR PROCESSES WITH SHORT INTENSE LASER PULSES
Prof. AD BANDRAUK, Dept. de Chimie, Univ. de Sherbrooke, Sherbrooke, Quebec, J1K 2R1, Canada
30 August-4 September 1987 : Magog, Canada 848/86

STRUCTURE OF THE PHOTOSYNTHETIC BACTERIAL REACTION CENTER : X-RAY CRYSTALLOG. & OPTICAL SPECTROSC. WITH POLARIZED LIGHT
STRUCTURE DU CENTRE DE REACTION BACTERIELLE PHOTOSYNTHETIQUE : CRISTALLOGRAPHIE X ET SPECTROSCOPIE OPTIQUE EN LUMIERE POLARISEE
Dr. J BRETON, Service de Biophysique, Dept. Biologie, CEN-Saclay, 91191 Gif-sur-Yvette, Cedex France
22-26 June 1987 : Cadarache, France 856/86

REFLECTION HIGH ENERGY ELECTRON DIFFRACTION AND REFLECTION IMAGING OF SURFACES
Dr. PK LARSEN, Philips Research Labs., 5600 JA Eindhoven, Netherlands
15-19 June 1987 : Eindhoven, Netherlands (CSLD) 291/86

ORGANIC AND INORGANIC LOW DIMENSIONAL MATERIALS
MATERIAUX ORGANIQUES ET MINERAUX A FAIBLE DIMENSIONALITE
Dr. P DELHAES, Centre de Recherche Paul Pascal, Domaine Universitaire, 33405 Talence Cedex, France
4-9 May 1987 : Minorca, Spain (CSLD) 292/86

PROPERTIES OF IMPURITY STATES IN SUPERLATTICE SEMICONDUCTORS
Prof. CY FONG, Dept. of Physics, Univ. of California, Davis, CA 95616, USA
7-11 September 1987 : Colchester, Essex, UK (CSLD) 881/86

RECENT ADVANCES IN MECHANISTIC AND SYNTHETIC ASPECTS OF POLYMERIZATIONS
RECENTS PROGRES DANS LES ASPECTS MECANISTIQUE ET SYNTHETIQUE DES POLYMERISATIONS
Prof. M. FONTANILLE, Lab. Chimie Polymères Organ., Univ. Bordeaux, 352 cours de la Libération, 33405 Talence, France
1-6 February 1987 : Bandol, France (SAM) 813/85

PHOTO-INDUCED CHARGE SEPARATION AND ENERGY MIGRATION IN SUPRAMOLECULAR SPECIES
Prof. V BALZANI, Inst. Chimico Ciamician, Via Selmi 2, Bologna, Italy
5-10 April 1987 : Capri, Italy (SAM) 490/86

CARBENE REACTIONS
Prof. L SKATTEBOL, Dept. of Chemistry, Univ. of Oslo, P.O. Box 1033, Blindern, 0315 Oslo 3, Norway
31 August-5 September 1987 : Fefor, Norway (SAM) 491/86

IMPORTANCE OF PARAMAGNETIC ORGANOMETALLIC COMPOUNDS IN ACTIVATION, SELECTIVITY AND CATALYSIS
IMPORTANCE DES COMPOSES ORGANOMETALLIQUES PARAMAGNETIQUES DANS L'ACTIVATION, LA SELECTIVITE ET LA CATALYSE
Prof. M CHANON, Lab. de Chimie Organ., Fac. des Sciences de St. Jerome, 13397 Marseille, Cedex 13, France
4-9 October 1987 : Bandol, France (SAM) 545/86

SELECTIVITY IN CHEMICAL REACTIONS
Dr. JC WHITEHEAD, Chemistry Dept., Manchester University, Manchester M13 9PL, UK
7-11 September 1987 : Bowness-on-Windemere, UK (SAM) 914/86

PERSPECTIVES IN THE SELECTIVE ACTIVATION OF C-H AND C-C BONDS IN SATURATED HYDROCARBONS
PERSPECTIVES DANS L'ACTIVATION SELECTIVE DES LIAISONS C-H ET C-C DES HYDROCARBURES SATURES
Dr. B MEUNIER, Lab. de Chimie de Coordin. du CNRS, 205, Rte de Narbonne, 31077 Toulouse Cedex, France
14-18 September 1987 : Albi, France (SAM) 928/86

GEOPHYSICS AND ASTROPHYSICS — *GEOPHYSIQUE ET ASTROPHYSIQUE*

NATURAL MECHANISMS OF SURFACE GENERATED NOISE IN THE OCEANS
Dr. BR KERMAN, Atmosph. Environ. Serv., Environment Canada, 4905 Dufferin St., Downsview, Ontario M3H 5T4, Canada
15-19 June 1987 : Santa Teresa, Italy 269/86

SECULAR SOLAR AND GEOMAGNETIC VARIATIONS IN THE LAST 10,000 YEARS
Dr. FR STEPHENSON, Dept., of Physics, Univ. of Durham, Durham DH1 3LE, UK
6-10 April 1987 : Durham, UK 632/86

COOLING FLOWS IN CLUSTERS AND GALAXIES
Dr. AC FABIAN, Inst. of Astronomy, Univ. of Cambridge, Madingley Rd., Cambridge CB3 0HA, UK
June 1987 : Cambridge, UK 755/86

GRAVITATIONAL WAVE DATA ANALYSIS
Prof. BF SCHUTZ, Dept. of Applied Maths and Astronomy, Univ. College, Cardiff, UK
6-9 July 1987 : Cardiff, UK 875/86

FLUID MOVEMENTS, ELEMENT TRANSPORT AND THE COMPOSITION OF THE CRUST
Prof. D BRIDGWATER, Geological Museum, Oster Voldgade 5-7, 1350 Copenhagen K, Denmark
18-23 May 1987 : Isdalsto, Nr. Bergen, Norway (GTM) 803/85

REGIONAL AND GLOBAL OZONE INTERACTION AND ITS ENVIRONMENTAL CONSEQUENCES
Prof. ISA ISAKSEN, Inst. of Geophysics, Oslo Univ., Box 1022, Blindern 0315, Oslo, Norway
25-29May 1987 : Lillehammer, Norway (GTM) 847/85

GROUNDWATER RECHARGE ESTIMATION IN ARID/SEMI-ARID REGIONS
Prof. I SIMMERS, Inst. of Earth Sciences, Free Univ., P.O.B. 7161, 1007 MC Amsterdam, Netherlands
8-15 March 1987 : Antalya, Turkey (GTM) 290/86

OCEAN-CLIMATE INTERACTION : IMPACT OF TEMPORAL AND SPATIAL VARIABILITY OF DEEP-WATER FORMATION (JOINT NATO/EEC WORKSHOP)
Dr. N WELLS, Dept. of Oceanography, Univ. of Southampton, Southampton, UK
28 September-2 October 1987 : Oxford, UK (GTM) 768/86

CRUST-MANTLE RECYCLING AT SUBDUCTION/COLLISION ZONES
Prof. SR HART, Dept. of Geology, M.I.T., Cambridge, MA 02139, USA
1-6 June 1987 : Antalya, Turkey (GTM) 869/86

MATHEMATICS — *MATHEMATIQUES*

PERSPECTIVES IN RING THEORY
Prof. F VAN OYSTAEYEN, Dept. of Mathematics, UIA, Universiteitsplein 1, 2610 Wilrijk, Belgium
20-28 July 1987 : Antwerp, Belgium 245/85

THE INTERACTION BETWEEN ALGORITHMS AND PROBLEM FORMULATIONS IN MATHEMATICAL PROGRAMMING ●
Dr. SW WALLACE, Chr. Michelsen Inst., 5036 Fantoft, Bergen, Norway
15-19 June 1987 : Bergen, Norway 586/86

CYCLES AND RAYS - BASIC STRUCTURES IN FINITE AND INFINITE GRAPHS
CYCLES ET RAYONS - STRUCTURES FONDAMENTALES DANS LES GRAPHES FINIS ET INFINIS
Prof. G SABIDUSSI, Centre de Rech. Math., Univ. de Montréal, C.P. 6128, Succ. A Montréal, Québec, Canada
3-9 May 1987 : Montréal, Canada 887/86

INFORMATICS — *INFORMATIQUE*

REAL TIME OBJECT AND ENVIRONMENT MEASUREMENT AND CLASSIFICATION
Dr. AK JAIN, Computer Science Dept., Michigan State Univ., East Lansing, MI 48824, USA
31 August-3 September 1987 : Limone sul Garda, Italy (Rob) 873/85

APPLIED SCIENCES AND ENGINEERING — *SCIENCES APPLIQUEES ET INGENIERIE*

ANALYTICAL USES OF IMMOBILIZED BIOLOGICAL COMPOUNDS FOR DETECTION, MEDICAL AND INDUSTRIAL USES ●
Prof. GG GUILBAULT, Dept. of Chemistry, Univ. of New Orleans, New Orleans, LA 70148, USA
4-8 May 1987 : Florence, Italy 582/86

APPLICATION OF POLYMERIC REINFORCEMENT IN SOIL RETAINING STRUCTURES ●
Prof. PM JARRETT, Dept. of Civil Eng., Royal Military College, Kingston, Ontario K7K 5LO, Canada
8-12 June 1987 : Kingston, Ontario, Canada 588/86

EMERGING TECHNOLOGIES FOR IN-SITU PROCESSING ●
Dr. J MELNGAILIS, Massachusetts Inst. of Technology, Room 39-427, Cambridge, MA 02139, USA
3-8 May 1987 : Cargese, France 766/86

MATHEMATICAL MODELLING IN COMBUSTION & RELATED TOPICS ●
MODELISATION MATHEMATIQUE EN COMBUSTION ET APPLICATIONS ●
Prof. CM BRAUNER, Ecole Centrale de Lyon, Dept. MIS, BP 163, 69131 Ecully Cedex, France
27-30 April 1987 : Lyon, France 845/86

DIRECT AND INVERSE METHODS IN RADAR POLARIMETRY ●
Dr. WM BOERNER, UIC-EECS Communications Lab., P.O. Box 4348, (M/C 154) Chicago, IL 60680 USA
24-30 May 1987 : Bad Windsheim, Germany 923/86

MOBILE ROBOT ISSUES
Prof. T KANADE, Dept. of Computer Science, Carnegie-Mellon Univ., Pittsburgh, PA 15213, USA
11-15 May 1987 : Limone sul Garda, Italy (Rob) 870/85

ADVANCES IN ANALYTICAL AND NUMERICAL GROUNDWATER FLOW AND QUALITY MODELLING
Prof. E CUSTODIO, Curso Internacional de Hidrologica Subterranea, Beethoven 15, Barcelona, Spain
1-5 June 1987 : Lisbon, Portugal (GTM) 884/86

IMPROVEMENTS IN DEEP SEISMIC SOUNDING PROCESSES
Dr. P GIESE, Freie Univ. Berlin, Fachbereich Geowissenschaften, 1000 Berlin 3, Germany
June 1987 : Miramare, Italy (GTM) 905/86

LABORATORY PRACTICES FOR SEDIMENT TRANSPORT STUDIES
Prof. HW SHEN, Dept. of Civil Eng., 412,O'Brien Hall, Univ. of California, Berkley, CA 94720, USA
18-22 August 1987 : Delft, Netherlands (GTM) 920/86

Further information on a particular meeting should be obtained from the meeting director named above

Further information on the NATO Science Programmes may be obtained from : Scientific Affairs Division (Ref. 1987-1), NATO, B - 1110 Brussels, Belgium