

LES HOUCHEES

école d'été de physique théorique

APPLICATION DES LASERS

A LA PHYSIQUE ATOMIQUE ET MOLECULAIRE

30 JUIN - 26 JUILLET 1975 - SESSION A

Course on laser theory - W.E. LAMB, University of Arizona

Laser spectroscopy in frequency and time domain in 2 and 3 level systems - M.S. FELD, MIT

Resonant interaction of strong light beams with an atomic system - C. COHEN-TANNOUDJI, ENS and Collège de France

Coherent optical spectroscopy - R. G. BREWER, IBM San Jose

Time resolved spectroscopy - S. STENHOLM, University of Helsinki

Use of laser in molecular spectroscopy and in the studies of energy transfer - T. OKA, Nat. Research Council of Canada

Probing small molecules with lasers - J.C. LEHMANN, ENS and Univ. de Paris VI

Laser isotope separation; combination of laser and nuclear spectroscopy - V.S. LETHOKOV, Institute of spectroscopy, Moscow (to be confirmed)

Recent advances in high resolution spectroscopy and the related areas - A. JAVAN, MIT

Additional seminars will be given by other lecturers, describing new techniques or newly performed experiments in the laser field. The session is intended both for atomic and laser physicists.

Fondée en 1951, l'Ecole occupe un ensemble de chalets de montagne entourés de prés et de bois, dans les Alpes françaises près de Chamonix, face au Mont-Blanc.

Sa situation offre des possibilités de promenade, de tourisme, d'escalade ou de méditation. Participants et conférenciers sont logés et nourris à l'école, pour un montant total de 1.100 francs environ. Des possibilités de bourse existent.

Les participants qui désirent louer pour leur famille un logement au village doivent s'adresser directement à l'Office du Tourisme, 74310 Les Houches.

Admission forms are available from

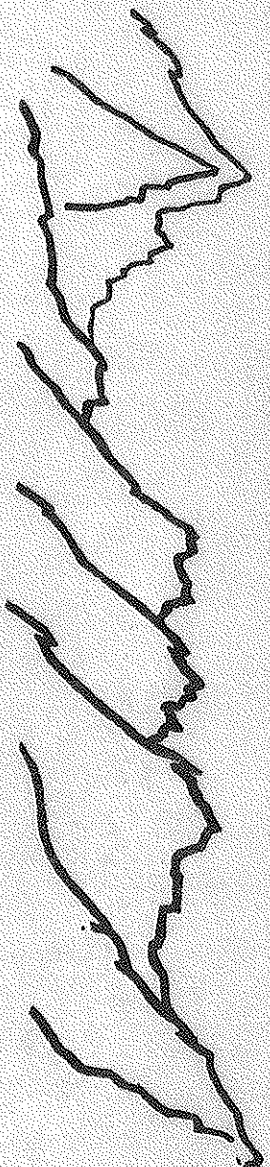
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74310 LES HOUCHEES - FRANCE

Complete files (admission forms and recommendation letters) must have reached this address **before 15 March 1975.**

Etant donné la nature des cours et le nombre des places disponibles (40), seules seront prises en considération les demandes d'admission pour la participation complète à la session.

La session B (28 Juillet - 6 Septembre 1975) portera sur les Méthodes en Théorie des Champs. Une session sur la Physique des Particules est prévue pour 1976.

LA FORMULE DE DEMANDE D'ADMISSION EST A LA DISPOSITION DES INTERESSES A L'ADRESSE CI-DESSUS



LES HOUCHEs

école d'été de physique théorique

METHODS EN THEORIE DES CHAMPS

28 JUILLET - 6 SEPTEMBRE 1975 - SESSION B

Functional methods - L.D. FADDEEV, Steklov Institut Leningrad (to be confirmed)

Renormalization theory - C. CALLAN, Princeton University

Gauge theories - B.W. LEE, FNAL Batavia

Renormalization group - D. GROSS, Princeton University

Quantum theory of gravitation - M.J.G. VELTMAN, Utrecht University

Theory of critical phenomena - E. BREZIN, Saclay

Additional lectures will be given by G.'t HOOFT and K.G. WILSON. The program will be self-contained and directed towards applications. The organization of the lectures should enable physicists not necessarily familiar with field theory to follow the session.

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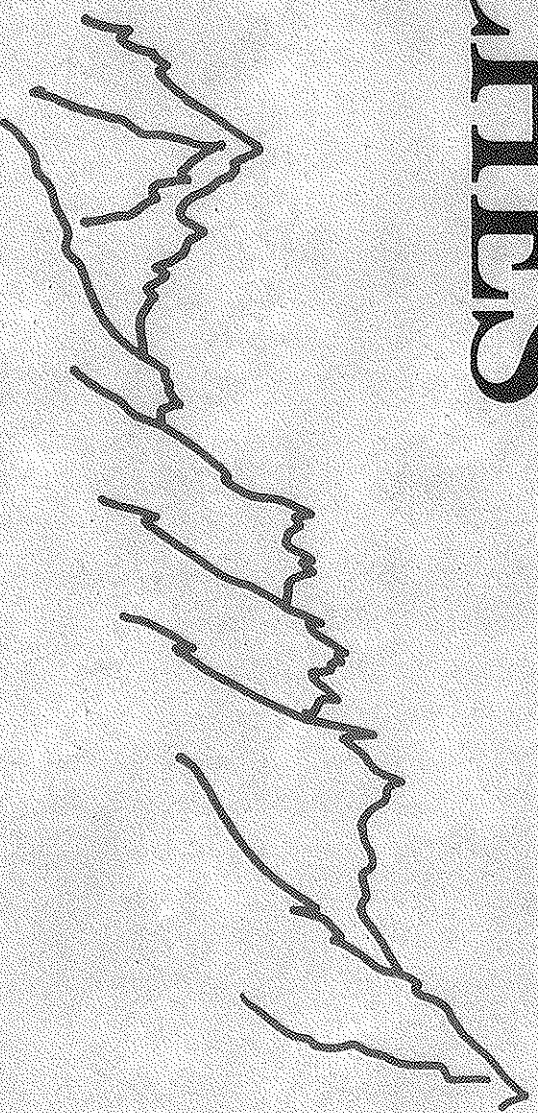
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Etant donné la nature des cours et le nombre des places disponibles (40), seules seront prises en considération les demandes d'admission pour la participation complète à la session.

La session A (30 Juin - 26 Juillet 1975) portera sur les Applications des Lasers à la Physique Atomique et Moléculaire. Une session sur la Physique des Particules est prévue pour 1976.

LA FORMULE DE DEMANDE D'ADMISSION EST A LA DISPOSITION DES INTERESSES A L'ADRESSE CI-DESSUS

LES HOUCHEES



SESSION XXXIV

30 Juin - 26 Juillet 1980

école d'été de physique théorique

INTERACTION PLASMA LASER LASER PLASMA INTERACTION

The physics of phenomena involved in dense plasma and in the related problem of inertial fusion: anomalous absorption of radiation, instability and turbulence, statistical mechanics, atomic physics in strong fields.

Principles of laser fusion, K.A. BRUECKNER, La Jolla

Experiments on inertial confinement, H. AHLSTROM, Livermore

The physics of coronal plasma, C. MAX, Livermore

Plasma instabilities and turbulence, R. PELLAT, Ecole Polytechnique

Numerical simulations, J.-C. ADAM, Ecole Polytechnique

Statistical mechanics of dense plasma, J.-P. HANSEN, Paris VI

Atoms in very strong fields, M. KLEPPNER, M.I.T.

Integral non-linear equations, M. KRUSKAL, Princeton

An additional program of seminars will enlighten the main topic by studying connected problems, such as astrophysical plasma, or introduction to bifurcations and stochasticity. All physicists, both experimentalists and theoreticians, interested in deepening their basic knowledge of plasma, are welcome to apply. A varied audience is expected, including physicists implied in inertial confinement, plasma turbulence, atomic physics, statistical mechanics, applied mathematics or astrophysics.

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Admission forms and additional informations are available from

ECOLE D'ETE DE PHYSIQUE THEORIQUE

74310 LES HOUCHEES - FRANCE

Telephone (50) 54 41 33

Complete files (admission forms and recommendation letters) **must** have reached this address before **8 March 1980**.

En 1981 se tiendront deux sessions, l'une consacrée à la stochasticité dans les processus déterministes, l'autre aux théories de jauge et leurs implications expérimentales.

La session d'Août 1980 portera sur la Physique des défauts.

LES HOUCHEES



SESSION XXXV

28 Juillet - 30 Août 1980

école d'été de physique théorique

PHYSIQUE DES DEFAUTS PHYSICS OF DEFECTS

The physics of dislocations, disclinations, walls and various singularities and topological configurations of the order parameter, in solids, liquid crystals, ferromagnets, and in geophysics.

Continuum theory of defects - E. KRÖNER, Stuttgart

Dislocations and walls in crystals - J. FRIEDEL, Orsay

Defects in thermotropic phases - R. B. MEYER, ~~Brandeis~~ *Boulogne*, Paris

Defects in lyotropic phases - W. HELFRICH, Freie Universität, Berlin

Defects in ferromagnets - J. C. SLONCZEWSKI, IBM, Yorktown

Dislocations and earthquakes - R. MADARIAGA, Institut de Physique du Globe, Paris

Topology in wave theory - M. BERRY, Bristol

Defects mediated phase transitions - B. HALPERIN, Harvard

Short courses on related topics will be given by I. DZYALOSHINSKII, F. C. FRANCK and R. THOM. An additional program of seminars will emphasize the underlying unity of the defect concept in a variety of fields. Materials scientists, physicists of all origins, geophysicists, experimentalists as well as theoreticians, are welcome to apply.

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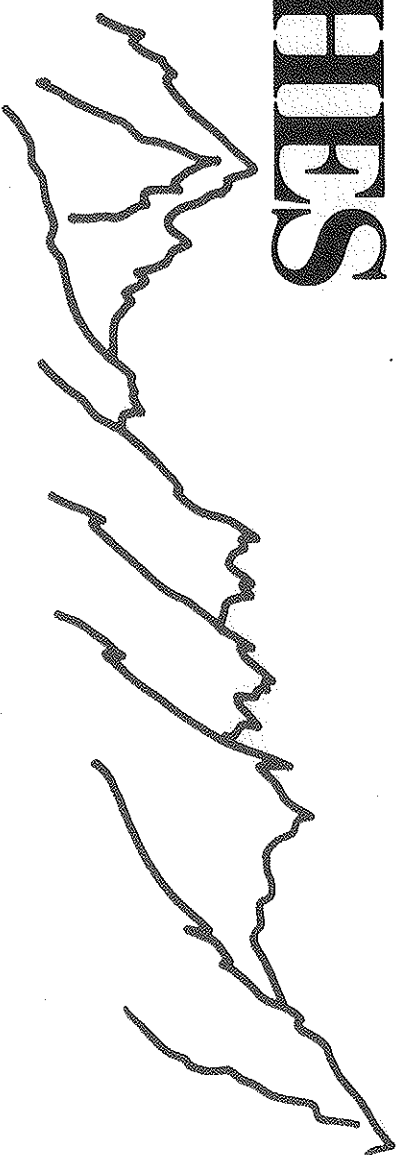
Telephone (50) 54 41 33

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En 1981 se tiendront deux sessions, l'une consacrée à la stochasticité dans les processus déterministes, l'autre aux théories de jauge et leurs implications expérimentales.

La session de Juillet 1980 portera sur l'interaction plasma laser.

LES HOUCHES



SESSION XXXVI

NATO ADVANCED STUDY INSTITUTE

29 juin - 31 juillet 1981

école d'été de physique théorique

COMPORTEMENT CHAOTIQUE DES SYSTÈMES DÉTERMINISTES

CHAOTIC BEHAVIOUR OF DETERMINISTIC SYSTEMS

Hamiltonian systems, M. BERRY, H.H. Wills Physics Lab., Bristol

J. MOSER, Math. Seminar ETH, Zurich

Introduction to chaotic behaviour, O.E. LANFORD III, Dept. of Math.,
Univ. of California, Berkeley

Asymptotic behaviour of dynamical systems, M. HENON, Observatoire, Nice

A. KATOK, Dept. of Math., Univ. Maryland

M. MISUREWICZ, Inst. Math. Warsaw

Bifurcations leading to chaos, D.D. JOSEPH, Dept. of Aerospace Eng. & Mechanics,
Univ. of Minnesota

S. NEWHOUSE, Dept. of Math. Univ. of North Carolina

The program is also expected to include courses by:

Ya. G. SINAI (Landau Institute, Moscow),

V.I. ARNOLD (Moscow University),

D.V. ANOSOV (Steklov Institute, Leningrad).

The above courses cover in depth most of the aspects of non linear dynamics with special emphasis on the use of concepts of bifurcation and strange attractors. A careful equilibrium is kept between the theoretical aspects and applications to various fields of mechanics (celestial and fluid dynamics, turbulence), of physics (plasmas ergodicity, accelerator design), of engineering, meteorology, population dynamics, etc. A varied audience is expected, including participants of pre and post doctoral level working either on the theory or on applied problems in any field of science, from the mathematical, numerical, experimental or technical viewpoints.

A series of additional courses and seminars on special related topics will be contributed by J.P. ECKMANN, J.P. GOLLUB, A. LIBCHABER, R.M. MAY, S.A. ORSZAG.

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Admission forms and additional informations are available from

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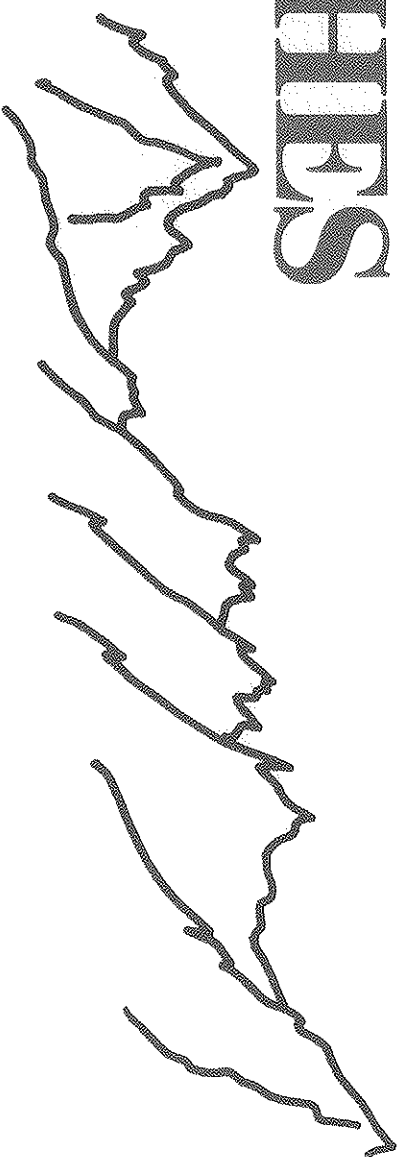
74310 LES HOUCHES, FRANCE

Telephone: (50) 54 41 33 and 54 40 69

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The session of August 1981 will be devoted to Gauge theories in high energy physics. Two sessions will be held in 1982, one on Atomic physics, the other on Field theory.

LES HOUCHEs



SESSION XXXVII
NATO-ADVANCED STUDY INSTITUTE
3 août - 11 septembre 1981

école d'été de physique théorique

THÉORIES DE JAUGE EN PHYSIQUE DES HAUTES ENERGIES GAUGE THEORIES IN HIGH ENERGY PHYSICS

Introduction to gauge theories, J. WESS, Karlsruhe

Perturbative quantum chromodynamics, C. SACHRAJDA, Southampton

Phenomenology of unified gauge theories, J. ELLIS, CERN

Non-perturbative quantum chromodynamics, S. COLEMAN, Harvard

e^+ and lepton-nucleon interactions, B. WILK, DESY

Nucleon-nucleon interactions, L. LEDERMAN, Fermilab

Properties of hadrons, C. QUIGG, Fermilab

The main courses listed above are concerned with the basic principles of gauge theories and their applications to high energy particle physics, as well as comparison with existing data and implications for very high energy experiments. They are mainly addressed to young theorists and experimenters working in high energy particle physics at the pre or post doctoral level but may also be of interest to astrophysicists and cosmologists. A complementary program of seminars will be devoted to connected topics ranging from the description of recent experimental results in accelerator physics, proton decay searches, and neutrino oscillations, to the recent theoretical progress in quark confinement, supergravity and unification, and the relevant aspects of astrophysics and cosmology. Seminar speakers will include G. KANE, L. SULAK, B. ZUMINO...

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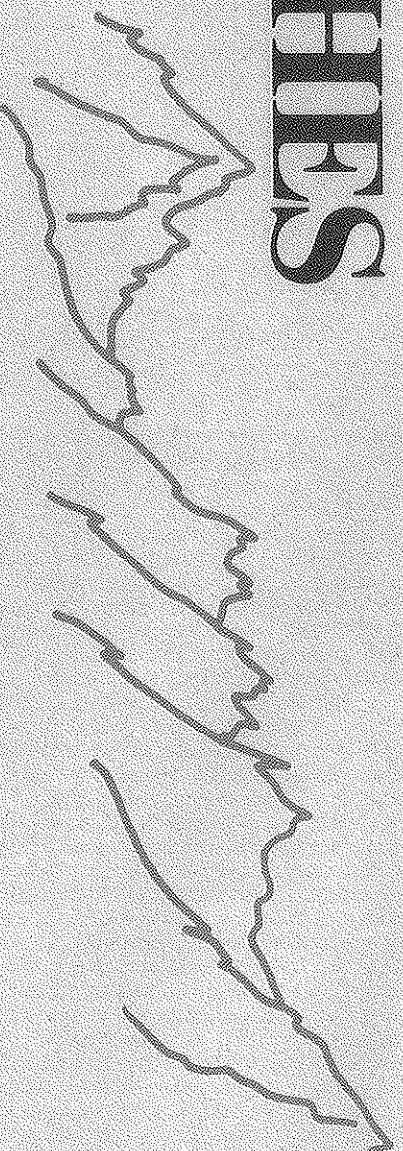
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74310 LES HOUCHEs, FRANCE**

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1 March 1981.*

The session of July 1981 will be devoted to Chaotic behaviour of deterministic systems. Two sessions will be held in 1982, one on Atomic Physics, the other on Field theory. The latter, which will cover functional methods, critical phenomena, two dimensional models and non perturbative gauge theories, will complement the present session from a more theoretical viewpoint.

LES HOUCHES



SESSION XXXVIII

NATO ADVANCED STUDY INSTITUTE

28 juin - 29 juillet 1982

école d'été de physique théorique

TENDANCES ACTUELLES EN PHYSIQUE ATOMIQUE

NEW TRENDS IN ATOMIC PHYSICS

Introduction to quantum electrodynamics, **C. COHEN-TANNOUDJI**,

Collège de France, Paris

Atomic physics of high Z systems, **H. BACKE**, Johannes Gutenberg University, Mainz
Effects of general relativity, **M. O. SCULLY**,

Max Planck Inst., Garching and Univ. of New Mexico

Introduction to gauge theories, **F. HAYOT**, CEA, Saclay
Fundamental problems in small molecules, **B. JUDD**,

Johns Hopkins University, Baltimore

Rydberg atoms, **S. HAROACHE**, Ecole Normale Supérieure, Paris
Trapped particles, **P. TOSCHEK**, University, Heidelberg
Polarized atoms at low temperature, **D. KLEPPNER**,

Massachusetts Institute of Technology

Effects of collisions, **P. BERMAN**, New York University

The above courses cover in depth several subjects of present interest in Atomic Physics. The main emphasis will be put on the theoretical understanding. However, experimental aspects will also be discussed either in the main courses or in additional courses. A varied audience is expected including researchers of pre or post doctoral level working on theoretical or experimental problems. Additional courses and seminars will be given by **M. A. BOUCHIAT**, **J. P. CONNERADE**, **U. FANO**, **S. LIBERMAN**, **Ph. NOZIERES**.

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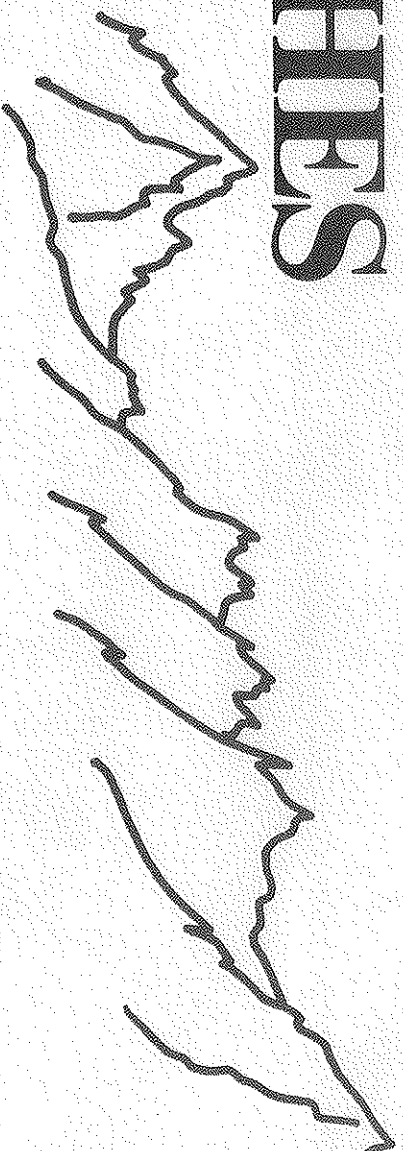
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*The session of August 1982 will be devoted to Field Theory and Statistical Mechanics.
Two sessions will be held in 1983 one on Astrophysics, the other on Quantum Gravity.*

LES HOUCHES



SESSION XXXIX

2 août - 10 septembre 1982

école d'été de physique théorique

DÉVELOPPEMENTS RÉCENTS EN THÉORIE DES CHAMPS ET MÉCANIQUE STATISTIQUE

RECENT ADVANCES IN FIELD THEORY AND STATISTICAL MECHANICS

Field Theory and Critical Phenomena, S. SHENKER, University of Chicago
Applications of Instanton Calculus, J. ZINN-JUSTIN, CEA Saclay
Spontaneously Broken Symmetry and Its Phenomenology, M. PESKIN,

Cornell University

Integrable models in 1 + 1 Quantum Field Theory, L.D. FADDEEV,
Steklov Institute, Leningrad

Lattice gauge theories, J. KOGUT, University of Illinois
Strings in Quantum Chromodynamics, A. NEVEU, E.N.S. Paris
Field Theory of Random Systems, G. PARISI, Frascati

The main courses will present recent progress at the interface between Field Theory and Statistical Mechanics. They are mainly intended to young researchers at the pre and postdoctoral level working in Statistical Mechanics, Condensed matter physics, Field Theory and Elementary particle physics, but may also be of interest to more experienced physicists working in Nuclear Physics, Astrophysics, or Mathematical physics. In addition short courses and seminars will cover some connected areas: New exact results in Field Theory and Statistical Mechanics, supergravity, finite temperature effects in field theory and their cosmological implications, disordered systems etc. Contributions to this programme are expected from J. FROHLICH, C. ITZYKSON, D.J. WALLACE...

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1 March 1982*

The session of July 1982 will be devoted to New Trends in Atomic Physics. Two sessions will be held in 1983, one on Astrophysics, the other on Quantized Gravity. The latter which will concentrate on the quantum aspects of gravitation theory will substantially complement the present session.

LES HOUCHEES



SESSION XLI

NATO ADVANCED STUDY INSTITUTE

8 août - 2 septembre 1983

école d'été de physique théorique

NAISSANCE ET ENFANCE DES ÉTOILES BIRTH AND INFANCY OF STARS

Star formation on Galactic Scales

J. LEQUEUX, Meudon, P.G. MEZGER, Bonn, J.L. PUGET, ENS and Meudon
Properties and Evolution of Molecular Clouds

M. GUELIN, IRAM, Grenoble, W.D. LANGER, Princeton, J. SILK, Berkeley
Observations of Protostars and of their Surroundings

C.G. WYNN-WILLIAMS, Hawaii, S.T. RIDGWAY, Kitt Peak, Tucson
Young stars and their Surroundings

G.H. HERBIG, Santa Cruz, D. DOWNES, IRAM, Grenoble
Protostars, Planets and the Solar System

H.W. YORKE, Göttingen, W.M. TSCHARNUTER, Wien, G.E. MORFILL, Garching
New Developments and Observational Prospects

H.J. HABING, Leiden, C.H. TOWNES, Berkeley

The above courses cover most of the aspects of the formation and of the early evolution of stars. The lectures keep a balance among the properties of interstellar clouds and of young stellar objects inferred from observations, the theoretical modelling of their evolution, and the opportunities which will be created by new observing facilities. The courses are mainly addressed to young astronomers working in the above fields at the pre- or post-doctoral level, but may also be of interest for researchers working in related fields. Although detailed studies of the formation of the Solar System will not be covered, special attention will be given to its relation to the general problem of star formation. A series of additional seminars will be organized on special objects and other related topics.

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Office du Tourisme, 74310 Les Houches (tel. (50) 54 40 62). The School is affiliated with the University of Grenoble, and this session is a NATO Advanced Study Institute.*

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The first session of 1983 will be entitled: Relativity, Groups and Topology.

Two sessions will be held in 1984 one on the molecular organization of genes and the programming of cellular differentiation, the other on the mathematical physics of critical phenomena.

LES HOUCHES



SESSION XL

NATO ADVANCED STUDY INSTITUTE

27 juin - 4 août 1983

école d'été de physique théorique

RELATIVITÉ, GROUPE ET TOPOLOGIE RELATIVITY, GROUPS AND TOPOLOGY

Topology with Applications to Quantum Field Theory, C.J. ISHAM,

Imperial College, London
Special Topics in Quantum Field Theory of Relevance to Quantum Gravity, R. JACKIW,
M.I.T.

Positive Energy Theorems, Y. CHOQUET-BRUHAT, Université de Paris
Quantum Field Theoretical Methods in Quantum Gravity, B. DE WITT,

University of Texas

Renormalization of Gauge Theories, C. BECCHI, Università di Genova
Significance and Future of Quantum Gravity, S. HAWKING, University of Cambridge

Supergravity: Methods, Goals and Successes, P. van NIEUWENHUIZEN,
S.U.N.Y. Stony Brook

Supergravity: Group Manifold Approach, T. REGGE, Università di Torino

By focusing on quantum gravity this session aims to display the broad theoretical setting of modern quantum field theory, embracing general relativity, group theory and topology. Quantum gravity is the most difficult of all quantum field theories. It demands the full arsenal of weapons developed in gauge theories, and more. The lectures will be pedagogically oriented and designed to help students use these weapons in research. There will also be a course on the **History of Quantum Field Theory** as well as seminars on special topics: Hidden symmetries and unusual cancellations; helicity amplitudes; nonperturbative techniques and unconventional summations; measurement theory; ... Contributions to this programme are expected from R. JOST, A. PAIS, B. ZUMINO ...

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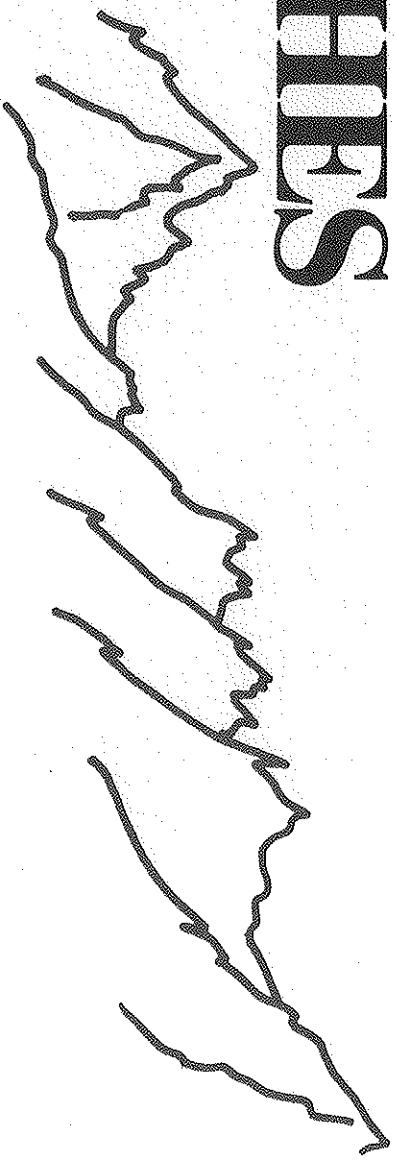
The second session of 1983 will be entitled Birth and Infancy of Stars.

Two sessions will be held in 1984 one on the molecular organization of genes and the pro-grammation of cellular differentiation, the other on the mathematical physics of critical phenomena.

LES HOUCHES

SESSION XLIII
NATO ADVANCED STUDY INSTITUTE

1^{er} août - 7 septembre 1984



école d'été de physique théorique

PHÉNOMÈNES CRITIQUES SYSTÈMES ALÉATOIRES THÉORIES DE JAUGE CRITICAL PHENOMENA RANDOM SYSTEMS GAUGE THEORIES

Introduction to Disordered Systems: A. THOULESS, University of Washington, Seattle
Random Systems

Disordered Systems: Mathematical Methods
J. FRÖHLICH, ETH Zurich, T. SPENCER, Courant Institute, N.Y.U. New York

Gauge Theories, Lattice Gauge Theories, Theoretical and Numerical Results
G. PARISI, Università di Roma

The Construction of Gauge Theory Models
D. BRYDGES, Univ. of Virginia, T. BALABAN, Harvard Univ., J. IMBRIE, Harvard Univ.

Renormalization Group Transformation, and 1/N Expansion
K. GAWEDSKI, I.H.E.S. Paris, A. KUPIAINEN, University of Helsinki

Dynamical Systems, KAM Theory: G. GALLAVOTTI, Istituto G. Castelnuovo, Roma

Stochastic Differential Equations, Large Deviations: S. VARADHAN, Courant Institute, New York
The Use of Computers in Mathematical Physics: O.E. LANFORD III, I.H.E.S. Paris

This session intends to offer a careful introduction to some of the major problems, ideas, methods, and results concerning critical phenomena, random systems, and gauge theories. Although the main emphasis will be on the mathematical physics aspects, the lectures will range from phenomenological physics to pure mathematics, and on a more technical level, from numerical model calculations to analytical and computer assisted proofs. The main purpose of the course will be to offer young scientists (less than 99 years of age), at the pre- or post-doctoral level, an introduction into the subject matter, and to guide them right to the frontier of current research. A series of seminars will be organized on special topics related to the main courses. Contributions to this program are expected from A. JAFFE, J. LEBOWITZ, E. LIEB, and others.

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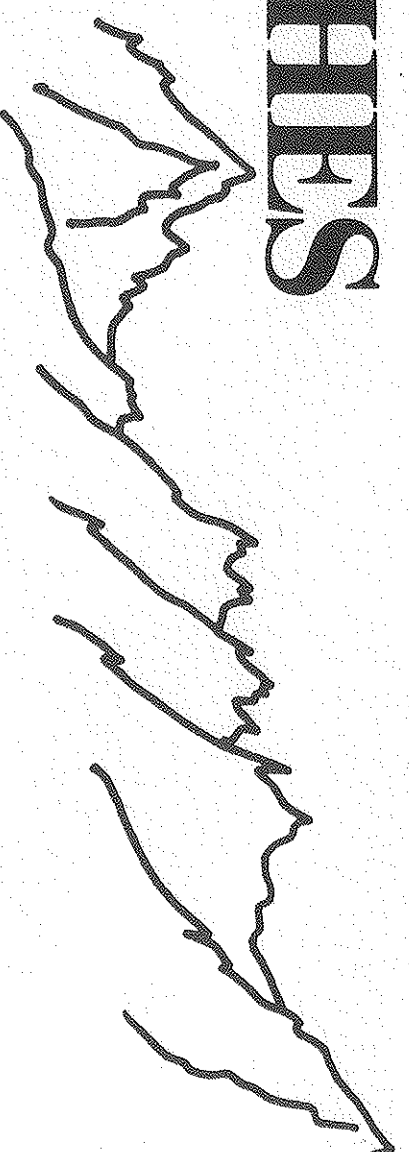
Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHES, FRANCE
Telephones: (50) 54 41 33 and 54 47 65 (off season)
54 40 69 (July 1 - September 10)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1984.

The first session of 1984 will be entitled Cellular and Molecular Aspects of Developmental Biology.
Two sessions will be held in 1985 one on the Phenomenology of Elementary Processes at High Energies, the other on Imaging and Signal Processing.

LES HOUCHES



SESSION XLII

NATO ADVANCED STUDY INSTITUTE

2 juillet - 27 juillet 1984

école d'été de physique théorique

ASPECTS CELLULAIRES ET MOLECULAIRES DE LA BIOLOGIE DU DÉVELOPPEMENT

CELLULAR AND MOLECULAR ASPECTS OF DEVELOPMENTAL BIOLOGY

BASIC BIOLOGY: Embryology, Morphogenesis, Cell Biology, Molecular Biology

F. CUZIN, Institut de Biochimie, Nice, H. EISEN, Institut Pasteur, Paris,
N. LE DOUARIN, Institut d'Embryologie, Nogent-sur-Marne,
B. MACH, Faculté de Médecine, Genève, D. SABATINI, School of Medicine, N.Y.U. New York

CELLULAR DIFFERENTIATION: SOME KEY MODELS

Primitive Eukaryotes: G. GEHRISH, Max Planck Institut, München,
I. HIRSKOWITZ, University of California, San Francisco
Nematodes: J. HODGKIN, University of Medical School, Cambridge

Drosophila: N.

Mouse: H. CONDAMINE, Institut Pasteur, Paris

ANALYSIS OF SOME INTEGRATED SYSTEMS

Neurobiology: Embryology: J. P. THIERRY, Institut d'Embryologie, Nogent-sur-Marne

Differentiation: C. GORIDS, INSERM CNRS Marseille Luminy

Synaptogenesis: J. P. CHANGEUX, Institut Pasteur, Paris

Intercellular Communications: M. LAZDUNSKI, Institut de Biochimie, Nice

Erythropoiesis: H. EISEN, Institut Pasteur, Paris

Intracellular Regulations (Endocrinology): K. R. YAMAMOTO, Univ. of California, San Francisco

The Immune System

Basic Elements of the Immune System: M. FOUGEREAU, INSERM CNRS Marseille Luminy

Organization of Immunoglobulin Genes: L. HOOD, Department of Biology, Caltech Pasadena

Major Histocompatibility Complex Genes: L. HOOD, Depart. of Biology, Caltech Pasadena

B. MACH, Faculté de Médecine, Genève

Regulation Network in Immunology: J. URBAIN, Université Libre, Bruxelles

This session will focus on modern approaches in developmental biology. It will address young biologists at the post-doctoral level wishing to broaden their knowledge in biology, as well as scientists in other fields with interests in life sciences. The session will start with a short refresher course in basic biology and will proceed with the most advanced aspects of some key models that are being used to elucidate the basis of cellular differentiation. An extensive analysis of some major physiological integrated systems will also be presented. The course will consist of lectures and seminars.

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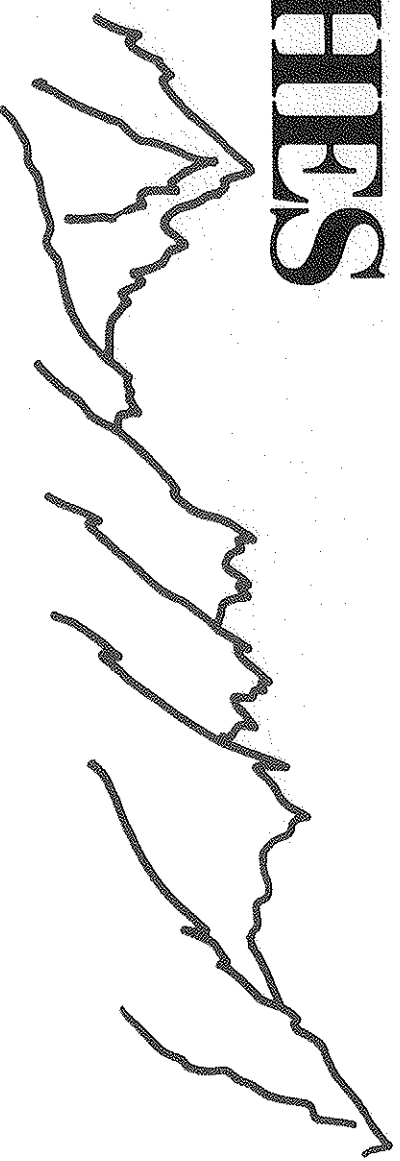
Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHES, FRANCE
Telephones: (50) 54 41 33 and 54 47 65 (off season)
54 40 69 (July 1 - September 10)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1984.

The second session of 1984 will be entitled *Critical Phenomena, Random Systems, Gauge Theories*.
Two sessions will be held in 1985 one on the *Phenomenology of Elementary Processes at High Energies*, the other on *Imaging and Signal Processing*.

LES HOUCHES



SESSION XLIV

NATO ADVANCED STUDY INSTITUTE

1^{er} juillet – 8 août 1985

école d'été de physique théorique

ARCHITECTURE DES INTERACTIONS FONDAMENTALES À COURTE DISTANCE

ARCHITECTURE OF FUNDAMENTAL INTERACTIONS AT SHORT DISTANCES

SU2 X U1 Breaking, Flavor, and other Puzzles in particle physics:

H. GEORGI, Harvard, USA

The new phenomenology:

Supersymmetry and all that:

Experimental Tests of the Electroweak theory (non collider):

F. DYDAK, CERN, Geneva, CH

Physics at the pp collider:

M. DELLA NEGRA, LAPP, Annecy, F.; CERN, Geneva, CH

Recent developments in supergravity theories:

H. NICOLAI, CERN, Geneva, CH

Effective Supersymmetric theories:

G.G. ROSS, Oxford, U.K.

Superstrings:

L. BRINK, Göteborg, Swe.

Monopoles in particle physics:

J. PRESKILL, Caltech, USA

Inner space and Outer space:

M.S. TURNER, Chicago, Fermi Lab, USA

Symmetries of higher dimensional theories:

R. SLANSKY, Los Alamos, USA

Kaluza-Klein Supergravity:

M. DUFF, Imperial College, London, U.K.

The aim of these courses is to examine the possible structures that might be encountered at shorter distances. The emphasis will be on the experimental consequences these theoretical constructs might have, on earth and elsewhere. The Electroweak theory will be used as the starting point of this exploration. The formulation of a phenomenological theory below Planck mass, the role of cosmology as a discriminant between possible theories are some of the topics to be covered. Since the road to better symmetries, i.e. supersymmetry, is paved in higher dimensions, the feasibility of such theories will also be explored. Several additional seminars will be organized. In particular P. Sikivie (Florida, USA) on axions. Others include D. Schramm (Chicago, USA), and E. Witten (Princeton, USA). The session is open to both high energy theorists and experimentalists who wish to familiarize themselves with current theoretical proposals and their confrontation with the evolving experimental situation.

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Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE – 74310 LES HOUCHES, FRANCE

Telephones: 50/54 41 33 and 54 47 65 (off season)

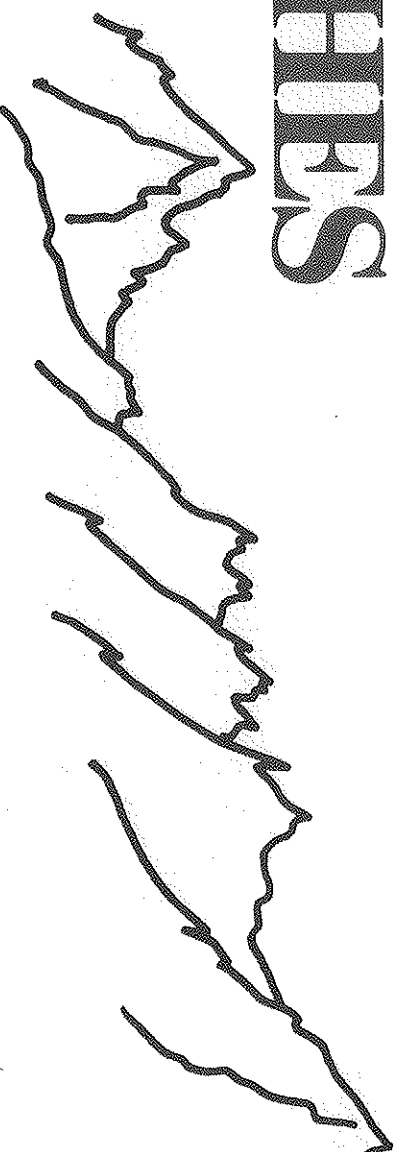
54 40 69 (July 1 – September 10)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1985.

The first session of 1985 will be entitled Architecture of Fundamental Interactions at Short Distances.

Two sessions will be held in 1986 one on Disordered Systems, the other on Atomic Physics of Strongly Ionized Atoms.

LES HOUCHEES



SESSION XLV

NATO ADVANCED STUDY INSTITUTE

12 août - 6 septembre 1985

école d'été de physique théorique

TRAITEMENT DU SIGNAL SIGNAL PROCESSING

THEORY :

Statistical Time Series Analysis, Random Function :

B. PICINBONO, E.S.E., Paris, F.

Detection and Estimation Theory :

L. SCHARF, Rhode Island Univ., USA

Linear and Non Linear Filtering :

T. KAILATH, I.S.L., Stanford, USA

Time Frequency Representation :

non parametric representation,

W. MECKLENBRAUKER, Tech. Univ., Vienna, A.

parametric representation :

Y. GRENIER, E.N.S.T., Paris F.

APPLICATIONS

Adaptive Systems :

T.S. DURRANI, Univ. Strathclyde, U.K.

Spectrum Estimation :

S. KAY, Rhode Island Univ., USA

Digital Signal Processing :

V. CAPPELLINI, Inst. Research

on Electromagnetic Waves, Firenze, I.

Image Processing and Reconstruction :

A. VENETSANOPOULOS, Toronto, Canada

Array Processing, Time Delay Estimation :

J.F. BOEHM, Ruhr Univ., Bochum, FRG

G.C. CARTER, N.U.S.C., New London, USA

TECHNOLOGY

Architecture of Signal Processing Systems : S.Y. KUNG, U.C.L.A., USA ;

S. REDDAWAY, I.C.L. Ltd, U.K.

Fast Algorithms for Signal Processing :

C. GUEGUEN, E.N.S.T., Paris, F.

This session intends to offer a synthetic presentation of the state of art in Signal Processing from the most recent developments of theoretical backgrounds to the most important fields of applications and the new technical aspects in system and algorithm design. The aim of the session is to allow specialists of all the areas of Signal Processing to get a clear and global view of the new challenging problems faced by the current development of signal processing taking into account the simultaneous growth of fundamental discoveries, the impulsive effect of users applications and of new hardware and software technologies. S. KAY, V. CAPPELLINI, G.C. CARTER, C. GUEGUEN and others will contribute to enlighten the new frontiers in this fast growing field.

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Admission forms and additional informations are available from :

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHEES, FRANCE

Telephones: 50/54 41 33 and 54 47 65 (off season)

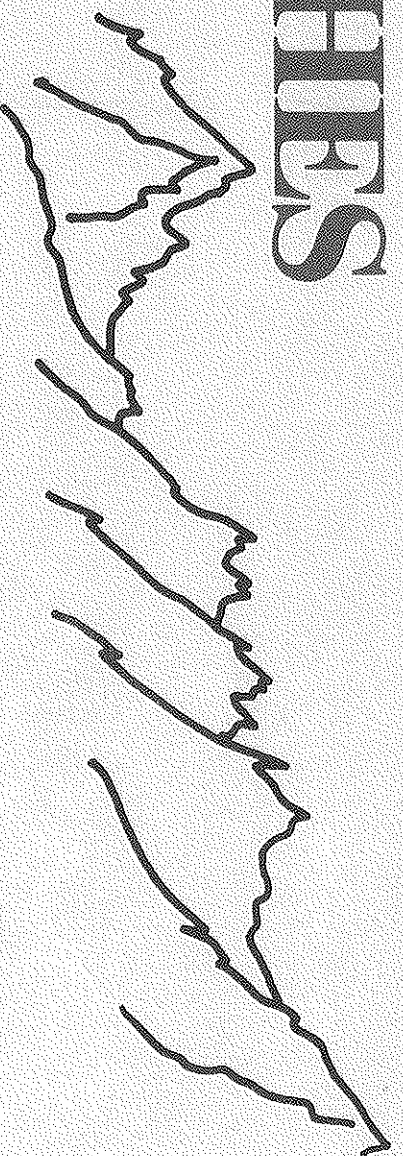
54 40 69 (July 1 - September 10)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1985.

The first session of 1985 will be entitled Architecture of Fundamental Interactions at Short Distances.

Two sessions will be held in 1986 one on Disordered Systems, the other on Atomic Physics of Strongly Ionized Atoms.

LES HOUCHEES



SESSION XLVI

NATO ADVANCED STUDY INSTITUTE

30 juin – 1 août 1986

école d'été de physique théorique

LE HASARD ET LA MATIÈRE CHANCE AND MATTER

Scientific Direction: J. SOULETIE, C.R.T.BT.-C.N.R.S., Grenoble
J. VANNIMENUS, E.N.S., Paris

Applications of Percolation: G. DEUTSCHER, Tel Aviv University
Random Macroscopic Media: E. GUYON, E.P.C., Paris
Irreversible random aggregation: T. WITTEN, Exxon Research, Annandale (N.J.)
Localization: T.V. RAMAKRISHNAN, Banaras Hindu University
Waves and electrons in disordered media: B. SOULLARD, Ecole Polytechnique, Palaiseau
Pattern selection: J.S. LANGER, I.T.P., Santa Barbara
Non linear phenomena: A. LIBCHABER, James Franck Institute, Chicago
Macroscopic quantum effects: A.J. LEGGETT, University of Illinois, Urbana
Spin Glasses: G. PARISI, Università di Roma II
Some applications of statistical physics: G. TOULOUSE, E.P.C., Paris

Some of the most difficult and interesting problems set to Solid State Physicists in the last few years have arisen from questions connected with the interplay of MATTER and RANDOMNESS. These have motivated remarkable developments of the experimental and numerical simulation techniques as well as of the methods of statistical physics which appear to be theoretical tools remarkably well adapted to these problems. Far from closing the subject, these developments have opened a significant number of new avenues towards related topics of fundamental as well as of technological interest at the borderline with a number of other disciplines (Chemistry, Biology, Mechanics of random media, Computer assisted design, ...). The courses are aimed at young physicists eager to enter this very lively and competitive field, and feeling the necessity to acquire some basic knowledge or broaden their views in some of the domains where the action stands.

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Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE – 74 310 LES HOUCHEES, FRANCE

Telephones: 50 54 40 69

54 41 33 and 54 47 65 (off season)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1986.

The second session of 1986 will be entitled The Limits of Nuclear Stability.

Two sessions will be held in 1987 one on Strongly Ionized Atoms, the other on Hydrodynamics and Astrophysics.

LES HOUCHEs



SESSION XLVII
NATO ADVANCED STUDY INSTITUTE
5 août – 30 août 1986

école d'été de physique théorique

LES LIMITES DE LA STABILITÉ NUCLÉAIRE

THE LIMITS OF NUCLEAR STABILITY

Scientific Direction: H. FLOCARD, I.P.N., Orsay

Equilibration of Collective variables: R. BALIAN, D.Ph.T., C.E.N. Saclay
Nuclear dynamics at intermediate energies: G. BERTSCH,

Michigan State University, East Lansing

Thermodynamics of hot nuclei: P. BONCHE, D.Ph.T., C.E.N. Saclay
Heavy Ion dynamics at high energies: J. CUGNON, Université de Liège
Shape change and band termination in rapidly rotating nuclei: I. RAGNARSSON,

Lund Institute of Technology

Gamow-Teller and beta decay of proton rich nuclei in the stellar environment: A. RICHTER,

Institut für Kernphysik, Darmstadt
Institut für Physik, München

Collective vibrations at high energies: P. RING, Technische Universität, München
Chaos in microscopic quantum systems: M. ZIRNBAUER,

W.K. Kellogg Radiation Lab, Cal. Tech., Pasadena
Trends in Heavy Ion reactions at medium energies: H. DOUBRE, GANIL, Caen

The school is devoted to nuclear properties in the excitation energy range around 10 MeV per nucleon. These can now be investigated thanks to the new experimental facilities at Caen, Michigan and Grenoble. Their interest lies in the fact that 10 MeV is roughly the maximal energy that a nucleus can absorb without disintegrating. This energy range is thus appropriate to the study of physical phenomena accompanying the transition from a bound nucleus to a collection of evaporating nucleons and light fragments. The main mechanisms studied here concern either global or collective excitations of nuclei. A few other important mechanisms will be reviewed as well, including quarks and nuclei. We also expect contributions from B. MOTTELSON and several seminar speakers. The session is open to young researchers who intend to specialize in either theoretical or experimental work concerning this exciting and lively area of nuclear physics.

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Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE – 74-310 LES HOUCHEs, France
Telephones: 50 54 40 69

54 41 33 and 54 47 65 (off season)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1986.

The first session of 1986 will be entitled Chance and Matter.

Two sessions will be held in 1987 one on Strongly Ionized Atoms, the other on Hydrodynamics and Astrophysics.

LES HOUCHEES

SESSION XLVIII

NATO ADVANCED STUDY INSTITUTE

29 juin – 31 juillet 1987



école d'été de physique théorique

DYNAMIQUE DES FLUIDES ASTROPHYSIQUES

ASTROPHYSICAL FLUID DYNAMICS

Scientific Direction: J.P. ZAHN, Observatoire de Toulouse, F

GENERAL FLUID DYNAMICS:

Introduction and Fundamentals: E.A. SPIEGEL, Columbia University, New York, USA

Hydrodynamical Turbulence: M. LESIEUR, Université de Grenoble, F

Compressible Flows: Y. POMEAU, E.N.S. Paris, F

Convection in the Presence of Rotation and magnetic Fields: J. TOOMRE,

University of Colorado, Boulder, USA

Magnetohydrodynamics: A. POUQUET, Observatoire de Nice, F

Rotating Fluids: R. SALMON, University of California, San Diego, USA

Non Linear Instabilities; Bifurcation to Chaos: E.A. SPIEGEL,

Columbia University, New York, USA

ASTROPHYSICAL FLUID DYNAMICS:

Introduction: E.A. SPIEGEL, Columbia University, New York, USA

Stellar Oscillations: D.O. GOUGH, University of Cambridge, UK

Photogas Dynamics: E.A. SPIEGEL, Columbia University, New York, USA

Instabilities and Turbulence in Rotating Objects: J.P. ZAHN, Observatoire de Toulouse, F

Dynamo Theories: J.H. ROBERTS, U.C.L.A., USA

Most objects in the Universe are made of ionized gases whose internal motions, owing to the large dimensions of these objects, result in most cases into highly turbulent flows. Astrophysical fluid dynamics is consequently developing in quite a specific manner. It is the goal of this course to provide astrophysicists with a high level treatment of fluid dynamics adapted to their needs and review the main applications to Astrophysics. It consequently emphasizes highly turbulent phenomena. The lectures will cover in depth the main specific aspects of astrophysical fluid dynamics. Additional seminars will be mostly devoted to numerical simulations which play an increasingly important role in compensating for the lack of direct experimentation. The course addresses in particular young scientists who wish to enter this field whose present growth owes both to the improvement of observational techniques and the expectation of the new generation of supercomputers, yielding a host of new data on the dynamics of most interesting astrophysical objects and allowing for the construction of more realistic models.

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Admission forms and additional informations are available from:

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEES, FRANCE

Telephones: 50 54 40 69 / 50 54 41 33 and 54 47 65 (off season)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1987.

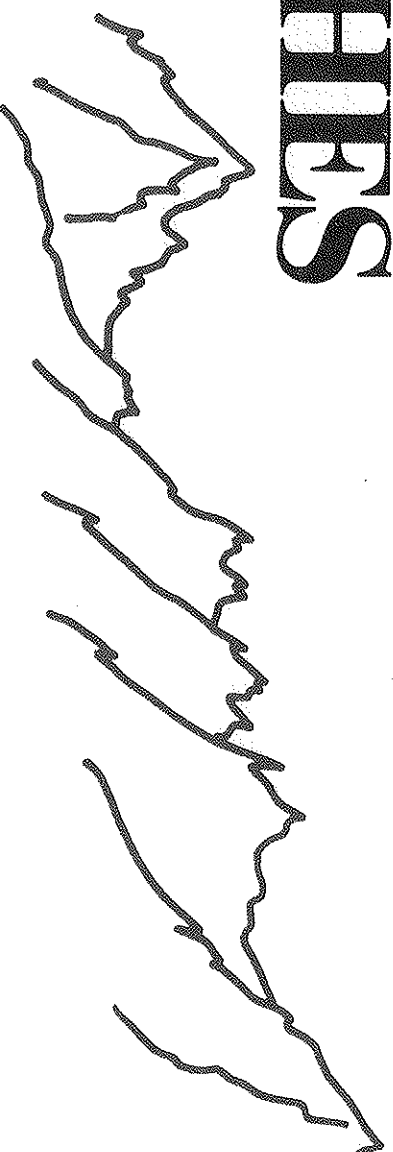
The second session of 1987 will be entitled Highly Ionized Atoms.

Two sessions will be held in 1988 one on Field Theory and Statistical Mechanics, the other on Geophysical Tomography.

LES HOUCHES

SESSION XLIX

4 août – 29 août 1987



école d'été de physique théorique

ATOMES TRÈS IONISÉS HIGHLY IONIZED ATOMS

Scientific Direction: J.P. DESCLAUX, C.E.N.G., Grenoble, F

Relativistic Theory of Atoms: J. SUCHER, University of Maryland, College Park, USA

Mean Field Theory of Many Electron Systems: K. DIETZ, University of Bonn, FRG

Supercritical Fields: F. BOSCH, GSI Darmstadt, J. REINHARDT, University of Frankfurt, FRG

Atomic Collisions: R. GAYET, A. SALIN, Université de Bordeaux I, Talence, F

Electron Ion Collisions: D. MOORES, P.J. STOREY, University College, London, UK

High Energy Particles in Aligned Crystals: J. KIMBALL, N. CUE,

University of New York, Albany, USA

Quantum electrodynamics (QED) of heavy atoms in strong fields and interactions between highly stripped ions and atoms or electrons are still challenging both theoreticians and experimentalists. Recent developments in ion sources and in the use of high energy accelerators and plasma sources for atomic physics have allowed very accurate tests of the fundamental theory of atomic structure and QED. Besides comprehensive series of lectures on these matters, the course will offer a series of seminars directed by P. JAEGLE on topics at the border line between Atomic Physics and Plasma Physics which have been stimulated by the need of atomic data for astrophysics and plasma physics. The lectures and seminars presented here aim at providing a comprehensive theoretical background for physicists willing to enter this field. Whereas the emphasis is on theory, connections with the latest experimental results will also be considered. The content of the course is such that it reaches the border of present knowledge but introductory lectures will offer young physicists the opportunity of in-depth formation.

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Admission forms and additional informations are available from:

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Telephones: 50 54 40 69

54 41 33 and 54 47 65 (off season)

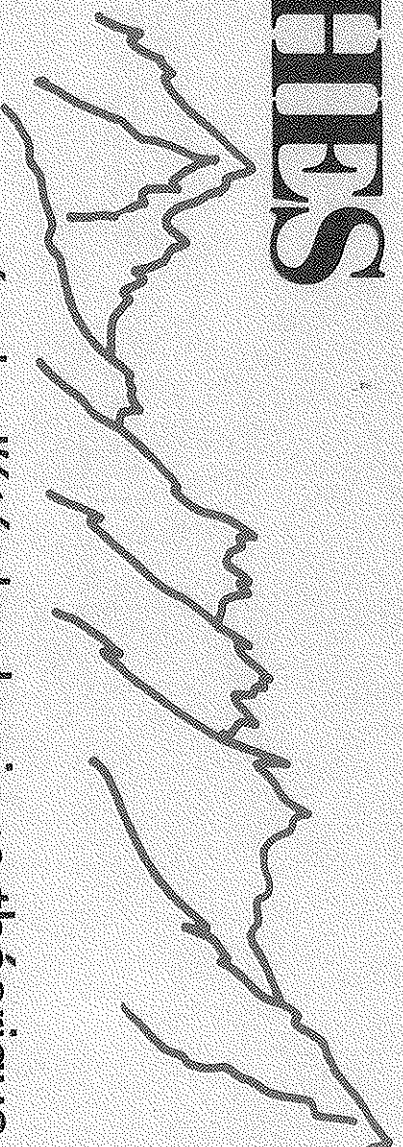
Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1987.

The first session of 1987 will be entitled Astrophysical Fluid Dynamics.

Two sessions will be held in 1988 one on Field Theory and Statistical Mechanics, the other on Geophysical Tomography.

LES HOUCHEs

SESSION XLVIII
NATO ADVANCED STUDY INSTITUTE
30 mai — 24 juin 1988



école d'été de physique théorique

LIQUIDES AUX INTERFACES LIQUIDS AT INTERFACES

Scientific Organizers : **J. CHARVOLIN**, Physique des Solides, Orsay

P.G. DE GENNES, Collège de France, Paris

W. HELFRICH, Freie Universität, Berlin

J.F. JOANNY, Université Claude Bernard, Lyon

Liquids and Interfacial Tensions : **R. EVANS, Bristol, UK and **J. MEUNIER**, ENS, Paris, F**

Wetting Transition : **M. SCHICK, Seattle, USA and **D. BEYSSENS**, CEN Saclay, F**

Wetting Dynamics : **P.G. DE GENNES and **A.M. CAZABAT**, Collège de France, Paris, F**

Interactions between Interfaces : **S. MARCELLJA, Canberra, Australia and **J. KLEIN**, Rehovot, Israel**

Films of Amphiphiles : **W. HELFRICH, Berlin, FRG and **J. CHARVOLIN**, Orsay, F**

Interfacial Instabilities : **J.S. LANGER, Santa Barbara, USA, **P. PELCE**, Marseille, F and **A. LIBCHABER**, Chicago, USA**

This school is concerned with surface properties of liquids at solid/liquid, liquid/liquid, gas/liquid interfaces. Renewals of interests for those domains belonging to classical physicochemistry appeared rather recently. They were motivated by the industrial importance of phenomena such as wetting of solids by liquids, interactions between colloidal particles, anchoring of liquid crystals, stabilization of liquid/liquid interfaces by amphiphilic molecules, kinetics of foams. These phenomena have been analyzed along new directions taking into account ideas developed in other fields, statistical mechanics of phase transitions and polymers, molecular interactions and long range forces in liquids. Their studies have stimulated the developments of new experimental methods, observations of motion of thin films on surfaces, measurements of forces between surfaces, structures of interfacial films by neutron scattering. The courses are aimed at young researchers who intend to acquire basic theoretical and experimental knowledge in this deeply renewed field.

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Admission forms and additional informations are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEs, France

Telephones : 50 54 40 69

50 54 41 33 and 50 54 47 65 (off season)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1988.

The two other sessions of 1988 will be entitled *Fields, Strings, Critical Phenomena and Geophysical Tomography*.

Two sessions will be held in 1989, one on *Liquids, Freezings and the Glass Transition*, the other on *Chaos and Quantum Physics*.

LES HOUCHEs

SESSION XLIX
NATO ADVANCED STUDY INSTITUTE
28 juin — 5 août 1988



école d'été de physique théorique

CĤAMPS, CORDES ET PHÉNOMÈNES CRITIQUES FIELDS, STRINGS, CRITICAL PHENOMENA

Scientific Director : E. BREZIN, ENS, Paris, F

Quantum Spin Chains : I. AFFLECK, Univ. of British Columbia, Canada
Conformal Invariance and Statistical Mechanics : J. CARDY, Dept. of Physics, Univ. of Calif.
Santa Barbara, USA

Supergravities from superstrings : S. FERRARA, CERN, Geneva, Sw.
Conformal Field Theories : D. FRIEDAN, Univ. of Chicago, USA
Affine Conformal Geometry : P. GINSPARG, Harvard Univ., USA
Selected Problems in Lattice QFT : M. LUSCHER, DESY, Hamburg, FRG
String Field Theories : A. NEVEU, CERN, Geneva, Sw.

**Additional lectures will be given by G. PARISI (Rome II, I) and A. POLYAKOV (Landau Inst.
Moscow) (titles to be announced)**

The realization that field theories and statistical mechanics had common aspects led in the past to spectacular advances in both fields. Non-perturbative methods in particle physics, such as lattice field theories, were inspired by statistical physics. More recently connexions between strings, conformal fields theories and critical phenomena in two dimensions have been discovered. This session of Les Houches is devoted to an introduction to these various topics with special emphasis on their mutual relations. The session is open to young theorists eager to acquire a basic knowledge or to broaden their views in these extremely active areas of physics.

Les Houches is a resort village in the Chamornix valley of the French Alps. Established in 1951, the School is located in a group of mountain chalets surrounded by meadows and woods at an altitude of 1000 m. It is above the village, facing the Mont-Blanc range. It is ideally for mountaineering, hiking or touring as well as for intellectual work. Accommodation and meals are provided within the School for both participants and lecturers. A financial contribution of FF 5100.— is requested from each participant. Some possibilities for grants exist. Participants who intend to rent lodgings should directly inquire at : Office du Tourisme, 74310 Les Houches (tel. 50 55 50 62). The School is affiliated with the University of Grenoble. This session is under consideration by the NATO Scientific Affairs Division.

Admission forms and additional informations are available from :

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEs, France
Telephones : 50 54 40 69

50 54 41 33 and 50 54 47 65 (off season)

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1988.

The two other sessions of 1988 will be entitled *Liquids at Interfaces and Geophysical Tomography*.

Two sessions will be held in 1989, one on *Liquids, Freezing and the Glass Transition*, the other on *Chaos and Quantum Physics*.

LES HOUCHEES



SESSION I
NATO ADVANCED STUDY INSTITUTE
9 août — 3 septembre 1988

école d'été de physique théorique

TOMOGRAPHIE GÉOPHYSIQUE GEOPHYSICAL TOMOGRAPHY

Scientific Direction : **Y. DESAUBIES, IFREMER, Brest, F**
A. TARANTOLA, Inst. de Physique du Globe, Paris, F

THEORY AND METHODS

Inverse Problems, Estimation Theory : **A. TARANTOLA, I.P.G. Paris, F**
Wave Propagation, Theoretical Seismology : **P.G. RICHARDS,**

L.D.G.O. Columbia Univ. New York, USA

Signal and Array Processing : **G. DUCKWORTH, M.I.T. Cambridge, USA**
GEOPHYSICAL TOMOGRAPHY

Tomography of the Earth's Crust : **R.W. CLAYTON, Caltech, USA**

Three Dimensional Global Structure : **J. WOODHOUSE, Harvard Univ., USA**

Electromagnetic Tomography : **T. MADDEN, M.I.T. Cambridge, USA**
TOMOGRAPHY IN THE OCEAN

Ocean Acoustic Tomography : **Y. DESAUBIES, IFREMER Brest, F**

Tomography and Inverse Modeling : **C. WUNSCH, M.I.T. Cambridge, USA**

Special Topics-Regional Processes : **W. MUNK, Univ. of California at San Diego, USA**

Additional invited seminars will be given by **B. CORNUELLE** (Univ. of Calif. San Diego: Time Dependent Tomography in Oceanography; **G. FRISK** (WHOI, Woods Hole, USA): Inverse Methods in Ocean Bottom Acoustics; **F. JENSEN** (Saclant Center, La Spezia, I): Ocean Seismo-acoustic Modeling; **D. KOSSLOFF** (Tel Aviv Univ.): Numerical Modeling in Seismology; **P. MORA** (Stanford Univ., USA): Non Linear Elastic Inversion; **B. ROMANOWICZ** (I.P.G., Paris): Global Tomography. In geophysics tomography is a technique which deduces some physical properties of the medium from perturbations encountered by waves propagating through it. Thus tomography draws on a variety of disciplines, such as wave propagation in heterogeneous (and/or random) media, statistical estimation and inverse theory, signal processing which are common to the study of the solid earth and the oceans. These topics will be considered, as well as specific applications and experimental results in: 3 dimensional imaging of the earth mantle, the shape of convection cells, high resolution, ocean dynamics, etc.. The lectures will be aimed at a level ranging from advanced graduate students to young scientists already engaged in research in geophysics or physical oceanography.

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Admission forms and additional informations are available from :

ECOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEES, France

Telephones : 50 54 40 69

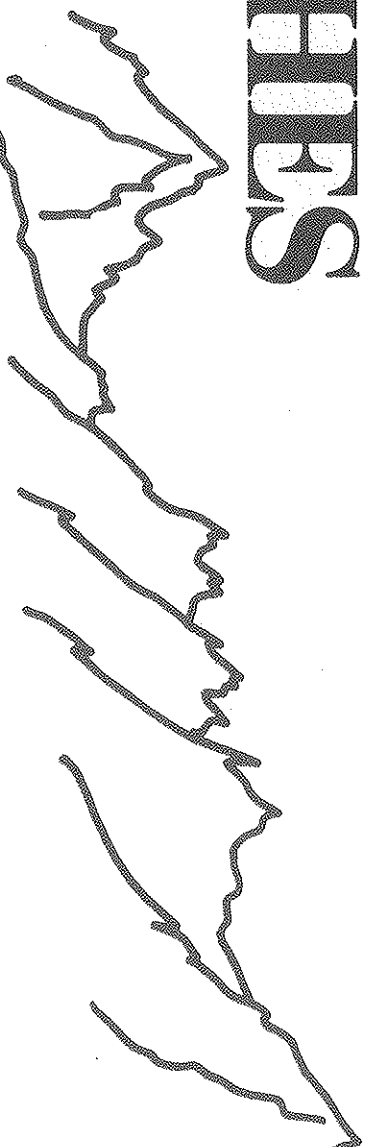
50 54 41 33 and 50 54 47 65 (off season)

Complete files (admission forms and recommendation letters) **must** have reached this address **before 1 March 1988.**

The two other sessions of 1988 will be entitled Fields, Strings, Critical Phenomena and Liquids at Interfaces.

Two sessions will be held in 1989, one on Liquids, Freezing and the Glass Transition, the other on Chaos and Quantum Physics.

LES HOUCHEs



SESSION LI
NATO-ADVANCED STUDY INSTITUTE
3 juillet — 28 juillet 1989

école d'été de physique théorique

Liquides, cristallisation et transition vitreuse **Liquids, freezing and the glass transition**

Scientific Direction : J.-P. HANSEN, École Normale Supérieure de Lyon, F
D. LEVESQUE, Univ. Paris-Sud, Orsay, F

Quantum Processes in Liquids : D. CHANDLER, Berkeley, USA
Kinetic Theory of Dense Fluids : M. ERNST, Utrecht, Netherlands
Statistical Mechanics of Liquid Crystals : D. FRENKEL, Amsterdam, Netherlands
Mode Coupling Theory of the Glass Transition : W. GOTZE, München, FRG
Molecular Liquids and Ionic Solutions : P. MADDEN, Oxford, UK
Neutron Scattering and Collective Dynamics : F. MEZEL, Berlin, FRG
Nucleation, Crystallization and Melting : D. OXTOBY, Chicago, USA
Colloidal Suspensions : P.N. PUSEY, Malvern, UK
Inhomogeneous Fluids and Interfacial Phenomena : B. WIDOM, Cornell, USA

The theoretical and experimental concepts and tools developed for the investigation of the structure and dynamics of simple liquids are now successfully extended to more complex systems, including molecular liquids, liquid crystals, colloidal suspensions and quantum processes. Density functional, kinetic and mode coupling theories are leading to a coherent picture of interfacial phenomena, nucleation, freezing and the glass transition. The present session is intended to provide a comprehensive overview of the basic concepts and of recent progress in statistical mechanics of liquids. The theoretical lectures will be illustrated by presentations of related light and neutron scattering experiments. The session is aimed at young theoreticians and experimentalists eager to acquire a good background in this rapidly growing condensed matter field.

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Admission forms and additional information are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE, F-74310 LES HOUCHEs, France

Telephones : 50 54 40 69

Telefax : 50 55 53 25

50 54 41 33 (off season)

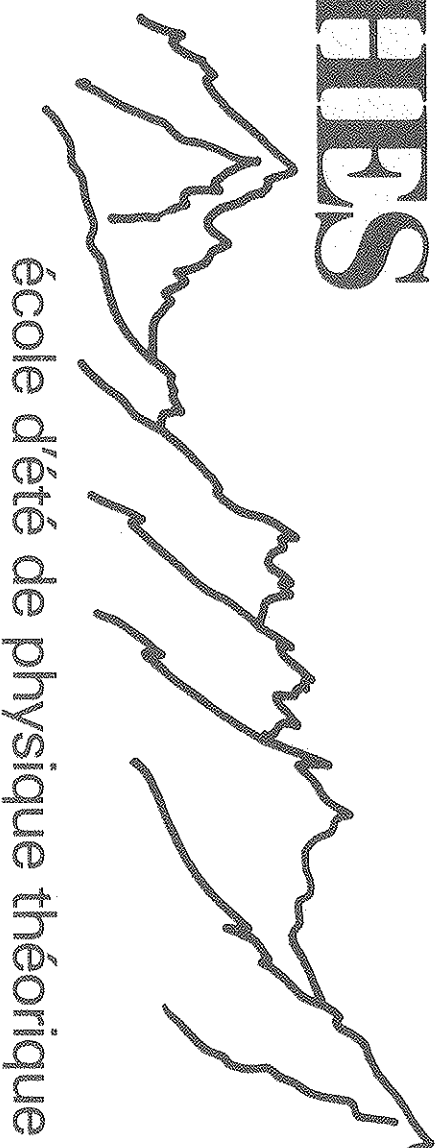
Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1989.

The second 1989 session will be entitled *Chaos and Quantum Physics*.

Two sessions will be held in 1990, one on *Quantum Optics*, the other on *Supernovae*.

LES HOUCHEs

SESSION LI
NATO ADVANCED STUDY INSTITUTE
1^{er} août — 31 août 1989



école d'été de physique théorique

Chaos et physique quantique Chaos and quantum physics

Scientific Direction : M.-J. GIANNONI, I.P.N. Orsay, F
A. VOROS, C.E.N. Saclay, F

Recent Developments in Classical Mechanics : I.C. PERCIVAL, London, UK
Semi-classical Methods : M.V. BERRY, Bristol, UK, and M.C. GUTZWILLER, New York, USA
Spectral Properties and Random Matrix Theory : O. BOHIGAS, Orsay, F
Time-dependent Quantum Systems : B.V. CHIRIKOV, Novosibirsk, USSR (to be confirmed)
Wave Functions : E.J. HELLER, Seattle, USA
Chaotic Scattering : U. SMILANSKY, Rehovot, Israël
Atomic Physics : D. DELANDE, Paris, F

Additional lectures will be given by G. CASATI (Milano), Y. COLIN DE VERDIÈRE (Grenoble), B. MÜHLSCHLEGEL (Köln) and C. SCHMIT (Orsay).

The understanding of chaotic behavior in classical dynamics has considerably advanced in the last decades. In turn, the need has arisen to understand in which ways a quantum system can feel the imprints of underlying classical stochasticity. From the growing activity upon this class of problems, an autonomous field of research has emerged, which is now in full strength. It lies at the crossroads of all branches of quantum physics, inasmuch as classical complexity is increasingly present in molecular, atomic, nuclear and solid state physics. This session of Les Houches is devoted to a theoretical coverage of the subject, illustrated by models, applications in various areas of physics, and new experimental trends. The lectures are aimed at graduate students and young researchers who intend to acquire a broad and solid theoretical knowledge in this inter-disciplinary, rapidly evolving subject.

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Admission forms and additional information are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE, F-74310 LES HOUCHEs, France

Telephones : 50 54 40 69

50 54 41 33 (off season)

Telefax : 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1989.

The first 1989 session will be entitled *Liquids, Freezing and the Glass Transition*.

Two sessions will be held in 1990, one on *Quantum Optics*, the other on *Supernovae*.

LES HOUCHES

SESSION LIII
NATO ADVANCED STUDY INSTITUTE
25 juin — 27 juillet 1990



école d'été de physique théorique

SYSTÈMES FONDAMENTAUX EN OPTIQUE QUANTIQUE FUNDAMENTAL SYSTEMS IN QUANTUM OPTICS

Scientific Direction : J. DALIBARD, ENS - CNRS, Paris, France

J.M. RAIMOND, ENS - Université Paris VI, France

Quantum Optics and Relativity : CH.J. BORDE, Univ. Paris Nord, France
Laser Cooling : C. COHEN-TANNOUDJI, Collège de France and ENS, Paris, France
Cavity Quantum Electrodynamics : S. HAROCHE, ENS Paris and Yale Univ., USA
Noise in Quantum Optics : H.J. KIMBLE, Cal. Tech., Pasadena, USA
Multi Stability and Chaos : L.A. LUGIATO, Politecnico di Torino, Italy
Non Linear Optics : Y.R. SHEN, Berkeley, USA
Cold Atomic Hydrogen and Collective Quantum Effects : J.T. WALRAVEN, Amsterdam, Netherlands
Trapped Ions Crystallization : H. WALTHER, Max Planck Inst., Garching, FRG

Additional lectures will be given by **D. KLEPPNER**, MIT (USA), **W. PHILLIPS**, NIST (USA),
S. REYNAUD, ENS (F), **W. SCHLEICH**, MPO (FRG)

The Quantum Optics of simple systems placed in a carefully controlled environment has evolved considerably in the past few years. Many new perspectives have been opened in various fields of fundamental Quantum Physics including the control of atomic motion, single atom radiation, new non linear effects, modifications of quantum noise. This session of Les Houches is devoted to a comprehensive discussion of these topics with a complementary program of seminars covering related fields such as low energy tests of gauge theories, semi classical methods, quantum chaos, atomic aggregates... The lectures are aimed at graduate students and young researchers who wish to acquire a broad and solid knowledge in this very active field.

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Admission forms and additional informations are available from :

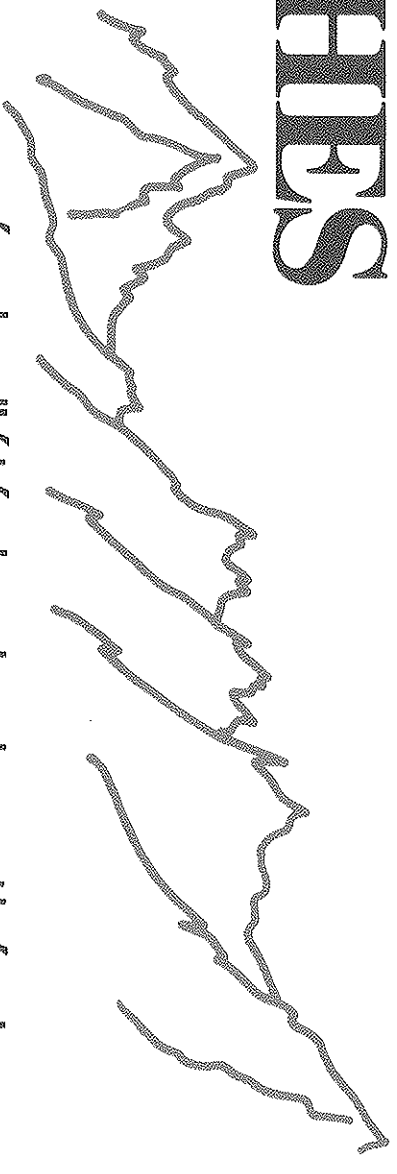
ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHES, FRANCE

Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1990.

The second 1990 session will be entitled Supernovae. Two sessions will be held in 1991, one on Phenomenology of Particles, the other on High Tc Supraconductors.

LES HOUCHEs



SESSION LIV
NATO ADVANCED STUDY INSTITUTE
31 juillet — 1^{er} septembre 1990

école d'été de physique théorique

SUPERNOVAE

Scientific Direction : J. AUDOUZE, IAP, Paris, France
S. BLUDMAN, University of Pennsylvania, USA

Observations of Supernovae : R.P. KIRSHNER, CfA, Cambridge, USA
Spectra, Light Curves and Cosmological Implications : D. BRANCH, Univ. of Oklahoma, USA
Supernova Statistics : G.A. TAMMANN, Astronomical Inst., Basel University, CH
Models for Type I Supernovae : K. NOMOTO, University of Tokyo, Japan,

R. CANAL, University of Barcelona, Spain

Models for Type II Supernovae : W. HILLEBRANDT, MPI, Garching, FRG
Evolution of Massive Stars : S.E. WOOSLEY, University of California, Santa Cruz, USA

Final Stages of Stellar Evolution : Z. BARKAT, Hebrew Univ. of Jerusalem, Israël
Nucleosynthesis in Supernovae : F.K. THIELEMANN, CfA, Cambridge, USA

Gamma Ray Line Emission from Supernovae : M. CASSE, CEN Saclay, France
Equation of State of Dense Matter : D. VAUTHERIN, IPN Orsay, France

Emission from Supernovae in Early Stages : D. NADYOZHIN, ITP, Moscow, USSR
Emission from Supernovae in Late Stages : C. FRANSSON, Stockholm Observatory, Sweden
Supernovae and the Interstellar Medium : R.A. CHEVALIER, Univ. of Virginia, USA

An additional programme of seminars will be organized by **R. MOCHKOVITCH, IAP, Paris, F**

Supernova explosions are among the most violent events occurring in the Universe. Their general understanding involves many different and exciting fields (hydrodynamics, radiation and neutrino transport, properties of matter in extreme physical conditions, general relativity...). Supernovae are also at the cornerstone between stellar and galactic evolution. They deeply affect the structure of the interstellar medium, accelerate cosmic rays and contribute to the enrichment of the Galaxy in heavy elements. These different aspects will be considered in a series of lectures and seminars. The observational properties of supernovae will be reviewed in detail and the theoretical framework for their description will be presented in a progressive and pedagogical way. Naturally, the emphasis will be given to the fascinating results obtained from SN 1987 A, which have confirmed several basic theoretical predictions but also have led to some new and unexpected developments. The content of the course is such that it will provide a comprehensive background for young astrophysicists wanting to enter the supernova field.

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Admission forms and additional informations are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEs, FRANCE

Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 15 March 1990.

The second 1990 session will be entitled "Fundamental systems in Quantum Optics". Two sessions will be held in 1991, one on Phenomenology of Particles, the other on High Tc Superconductors.

LES HOUCHEs



SESSION LV
NATO ADVANCED STUDY INSTITUTE
30 juin — 26 juillet 1991

école d'été de physique théorique

LA PHYSIQUE DES PARTICULES DANS LES ANNÉES QUATRE VINGT DIX PARTICLES IN THE NINETIES

Scientific Direction : J. ILIOPoulos, ENS-CNRS, Paris, France

The Standard electroweak model : G. ALTARELLI, CERN, Geneva, CH and L. MAIANI, Univ. di Roma I, I
Q.C.D. confronts experiment : A. MUELLER, Columbia, New-York, USA

Beyond the standard model : P. FAYET, ENS, Paris, F
Superstrings : D. GROSS, Princeton, USA

Lattice gauge theories : G. PARISI, Univ. di Roma II, I

e^+e^- experimental results : M. DAVERI, L.A.L., Orsay, F and A. WAGNER, Heidelberg, F.R.G.

$\bar{p}p$ experimental results : M. SHOCHET, Chicago, USA

Additional lectures will be given by S. COLEMAN (Harvard, USA), S.L. GLASHOW (Harvard, USA),
G. 't HOOFT (Utrecht, the Netherlands), K. KOUNNAS (ENS, France), D.V. NANOPoulos (Texas, USA)

In the physics of elementary particles the coming years may turn out to be decisive. LEP has already provided the answers to some outstanding questions of particle physics. We know the exact number of light neutrino species and we have improved limits on new particles. With high precision measurements we shall be able to test the theory at the level of radiative corrections. But also these years will be those of preparation for the next generation of supercolliders. They will open the way to the TeV scale, which is expected to be the scale of new fundamental physics. Questions such as the origin of spontaneous symmetry breaking, the elementary or composite nature of quarks and leptons or the existence of new interactions may be answered at this scale. The purpose of the School will be twofold : on the one hand it will teach young scientists the physical ideas and the powerful techniques of modern elementary particle physics. On the other hand it aims at bringing young theorists in contact with the latest experimental results.

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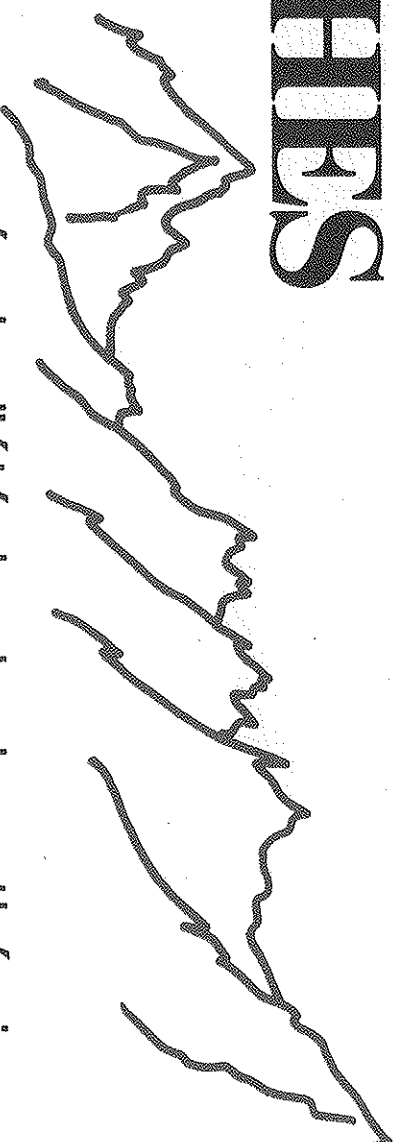
Admission forms and additional information are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEs, FRANCE

Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before March 1, 1991. The second 1991 session will be entitled "STRONGLY INTERACTING FERMIONS AND HIGH Tc SUPERCONDUCTIVITY". Two sessions will be held in 1992, one on Gravitation and Quantification, the other on Image Processing.

LES HOUCHEs



SESSION LVI
NATO ADVANCED STUDY INSTITUTE
30 juillet — 31 août 1991

école d'été de physique théorique

FERMIONS EN FORTÉ INTERACTION ET SUPRACONDUCTIVITÉ A HAUTE TEMPÉRATURE STRONGLY INTERACTING FERMIONS AND HIGH T_c SUPERCONDUCTIVITY

Scientific Direction : B. DOUCOT, CRTBT - CNRS, Grenoble, F
R. RAMMAL, CRTBT - CNRS, Grenoble, F

Introduction to strongly correlated systems : T.M. RICE, ETH Zürich, CH
Experimental properties of low dimensional electron gases in organic and high T_c Superconductors :
D. JEROME, Université d'Orsay, Paris, F

Fermi Liquid Theory : W. KOHN, Univ. of California, Santa Barbara, USA
Fermionic Methods for elementary statistical systems : C. ITZYKSON, CEA, Saclay, F
Quantum Monte Carlo for Interacting Fermions : D. CEPERLEY, Univ. of Illinois, USA
Numerical Methods for Quantum spin systems : A.P. YOUNG, Santa Cruz, USA
Phenomenology and Modelling of high T_c Superconductors : P. LITTLEWOOD, Bell Labs. Murray Hill, USA
Strongly interacting Fermions in one dimension : F.D.M. HALDANE, Princeton University, USA
Questions, Controversies and frustration in Quantum Antiferromagnetism : P. COLEMAN, Rutgers Univ., USA
P. CHANDRA, NEC, Princeton, USA
Exotic Excitations and their interactions in strongly coupled Fermion systems : R. SCHRIEFFER,
Univ. of California, Santa Barbara, USA

Since its discovery in 1986, high temperature superconductivity has stimulated a tremendous research activity, on both experimental and theoretical sides. The physical properties of these systems are beginning to be established on solid grounds from the wealth of experimental results. At this point, it seems quite clear that these materials belong to the class of strongly correlated fermion systems, for which doped Mott insulators appear as a paradigm. Analogies with other fields such as heavy fermions, quantized Hall effect, fractional statistics are blossoming and provide new insights since conventional perturbative methods break down. The school is intended to provide a clear exposition of these new concepts which are deeply changing the research in condensed matter physics. Among others, a complete review on experimental properties of these materials will be given. The lecture on Fermi Liquid. Theory is aimed to provide a better understanding of this quite successful theory, in order to identify the dramatically new features of high T_c superconductors compared to conventional Fermi Liquids. Similarities with other systems and key concepts such as Luttinger liquids, heavy fermions, fractional statistics, flux phases will be discussed. And since now, numerical techniques (Quantum Monte Carlo, exact diagonalization) have become a major source of information on lattice models, pedagogical reviews on these methods are included. As usual, seminars given by the participants and study groups on specific topics will be organized.

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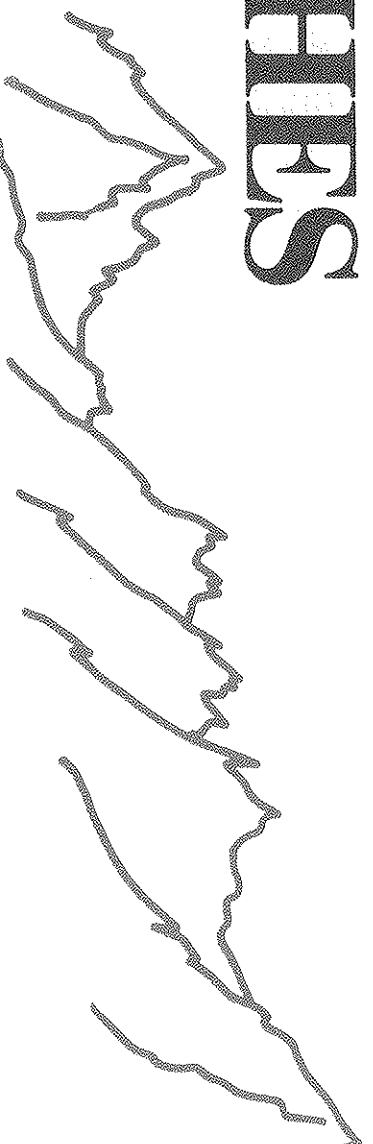
Admission forms and additional informations are available from :

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Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1991. The second 1991 session will be entitled "Particles in the nineties". Two sessions will be held in 1992, one on Gravitation and Quantification, the other on Image Processing.

LES HOUCHEs



SESSION LVII
NATO ADVANCED STUDY INSTITUTE
5 juillet — 1^{er} août 1992

école d'été de physique théorique

GRAVITATION ET QUANTIFICATIONS GRAVITATION AND QUANTIZATIONS

Scientific Direction : B. JULIA, ENS - CNRS, Paris, France

Experimental constraints on Gravitation theories : T. DAMOUR, I.H.E.S. France
Quantization Methods : G. ZUCKERMANN, Yale, USA

Non perturbative Canonical Gravity : A. ASHTEKAR, Syracuse, USA
Quantum Mechanics for closed systems and spacetimes : J. HARTLE, UCSB, USA
Quantum Gravity and String theories : L. ALVAREZ-GAUME, CERN, CH

Quantization in curved spacetimes : R. WALD, Chicago, USA

Two-dimensional Quantum Gravity and String theory : F. DAVID, CEA, Saclay and E. BREZIN, ENS, France

Two-dimensional Quantum Geometry : A. POLYAKOV, Princeton, USA

Non-commutative Geometry : A. CONNES, Collège de France, France

Colloquium lectures will be given by B. de WITT (Austin, USA), T. REGGE (Torino, Italy), G. 't HOOFT (Utrecht, Netherlands), P. van NIEUWENHUIZEN (Leiden, Neth. and Stony Brook, USA), (G. WILKOVISKY Lebedev Ph. Institute, USSR, to be confirmed)...

In the coming years we shall hopefully discover and study classical gravitational waves, emitted during the collapse of supernovae or close binaries for example. The theoretical understanding of the corresponding quantum theory remains one of the main challenges of Physics. The School will be a thorough preparation for young scientists interested in this problem but also for all those who will use advanced methods of quantization. It is also addressed to physicists and mathematicians interested in the recent developments in string theory and quantum geometry and to cosmologists. Seminars by participants and study groups will be organized on the latest developments.

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Admission forms and additional informations are available from :

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Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1992

The second 1992 session will be entitled "Progress in Picture Processing".

Two sessions will be held in 1993, one on Computational fluid dynamics, the other on Cosmology and large scale structure.

LES HOUCHEs

SESSION LVIII
NATO ADVANCED STUDY INSTITUTE
10 août — 4 septembre 1992



école d'été de physique théorique

LES PROGRÈS DU TRAITEMENT DES IMAGES PROGRESS IN PICTURE PROCESSING

Scientific Direction : H. MAITRE, TELECOM-Paris, France

Discrete Representations : G. BORGEFORS, Swed Def. Res. Est. Sweden
Feature Extraction : P. ZAMPERONI, Univ. Braunschweig, Germany
Restoration and Filtering : J. BIEMOND, Univ. Delft, Netherland
Scene Analysis : R. NEVATIA, Univ. South. California, USA
Markov Random Fields : R. AZENCOTT, Univ. Paris XI, France
Mathematical Morphology : F. PRETEUX, Telecom-Paris, France
3D Object Processing : T. KASVAND, Concordia Univ., Canada

Additional lectures will be given by **S. MALLAT** (New-York Univ., USA), **F. SCHMITT** (Telecom-Paris), **N. FARVARDIN** (Univ. Maryland, USA).

In the 90s, digital picture processing enters a period of maturity which makes it one of the most powerful and most reliable tools in the field of computer sciences. In the domains of robot vision, quality control, autonomous vehicle guidance, for aerial and satellite image interpretation as well as for the medical diagnosis, digital picture processing appears as an unavoidable stage. Fundamentals of picture processing are now well established : they collect techniques issued from signal processing, mathematics, cognitive sciences, psychophysics and neurophysiology, but they also encompass novel and original methods originated from an exceptionally rich experience in the service of industry and research. The purpose of the Summer School is to provide an up-to-date review of the fundamentals of picture processing, starting from the very beginning (sampling theorem, filtering, Fourier transform, etc.), focusing on the mature topics : (mathematical morphology, markov random fields, scale space decomposition), and addressing the newly emerging techniques : wavelets, 3D representations and recognition. The attendees will be non-specialists of picture processing, having a good knowledge of signal processing, mathematics and computer science.

Les Houches is a resort village in the ChamoniX valley of the French Alps. Established in 1951, the School is located in a group of mountain chalets surrounded by meadows and woods at an altitude of 1000 m. It is above the village, facing the Mont-Blanc range. It is ideal for mountaineering, hiking or touring as well as for intellectual work. Accommodation and meals are provided within the School for both participants and lecturers. A financial contribution of FF 3500 — is requested from each participant. Some possibilities for grants exist. Participants who intend to rent lodgings should directly inquire at : Office du Tourisme, 74310 Les Houches (tel. 50 55 50 62). The School is affiliated to the University of Grenoble. This session is a NATO Advanced Study Institute and is granted by "la formation permanente du CNRS".

Admission forms and additional information are available from :

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHEs, FRANCE

Telephone : (33) 50 54 40 69 / Fax : (33) 50 55 53 25

Complete files (admission forms and recommendation letters) **must** have reached this address **before March 1, 1992.**

The second 1992 session will be entitled "Gravitation and Quantizations".

Two sessions will be held in 1993, one on Computational fluid dynamics, the other on Cosmology and large Scale Structure.

LES HOUCHES



SESSION LIX
NATO ADVANCED STUDY INSTITUTE
28 juin — 30 juillet 1993

école d'été de physique théorique

MÉCANIQUE DES FLUIDES NUMÉRIQUE COMPUTATIONAL FLUID DYNAMICS

Scientific Direction: M. LESIEUR, Institut de Mécanique de Grenoble, France

Incompressible Turbulent Flows: J. FERZIGER, Stanford, USA
Vortex Dynamics: A. CHORIN, Berkeley, USA
Spectral Methods: C. CANUTO, Torino, Italy
Turbulence and Coherent Vortices: M. LESIEUR, Grenoble, France
Compressible and Reacting Flows: J. RILEY, Seattle, USA
Viscous Flows and Non-Linear Hyperbolic Problems: R. GLOWINSKI, INRIA, France
Atmospheric Phenomena: D. LILLY, Univ. Oklahoma, USA
Oceanic Circulation Modelling: W. HOLLAND, NCAR, USA
Industrial Flows Modelling: B. LAUNDER, Manchester, Great Britain
Massively Parallel Computations: R. RANNACHER, Heidelberg, Germany

The unprecedented increase of computer power, combined with the development of efficient visualization tools, has irreversibly changed the landscape of fluid dynamics in its fundamental and applied aspects. Precise and fast numerical algorithms provide accurate solutions for the equations of fluid motion, in particular for phenomena which are rapidly changing in time and space, such as turbulence, vortices and shock waves. The applications of Computational Fluid Dynamics (CFD) are immense, e.g. in hypersonic aerodynamics, combustion and propulsion, meteorology, oceanography, climate studies, pollution in the environment, internal geophysics or astrophysics. From a more theoretical standpoint, these new numerical tools are bringing a revolution in the understanding of continuous media physics, and shed new light on instability, vortices, deterministic chaos, intermittency and fractal geometry. The programme will give a broad presentation of all the principal aspects of CFD, combining discussion of the various numerical methods with examples from physical, environmental or industrial applications. It is intended in particular for selected graduate students and young scientists and engineers. Additional lectures given by leading experts will present recent results in CFD as well as from the laboratory. Practical CFD work will be also carried out by students, in a CFD laboratory specially settled for the duration of the programme.

Additional lecturers: confirmed participation of C. BEGUIER, R. BILGER, J.P. BONNET, M. BRACHET, J.P. CHOLLET, P. COMTE, P. COULLET, Y. GAGNE, M. GASTER, E. HOPFINGER, B. LEGRAS, M. MENEGUZZI, O METAIS, A. MORICE, J. PEREIRA, J. PERIAUX, J. SOMMERIA, A. TSINOBER, J. VERRON.

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Admission forms and additional informations are available from:

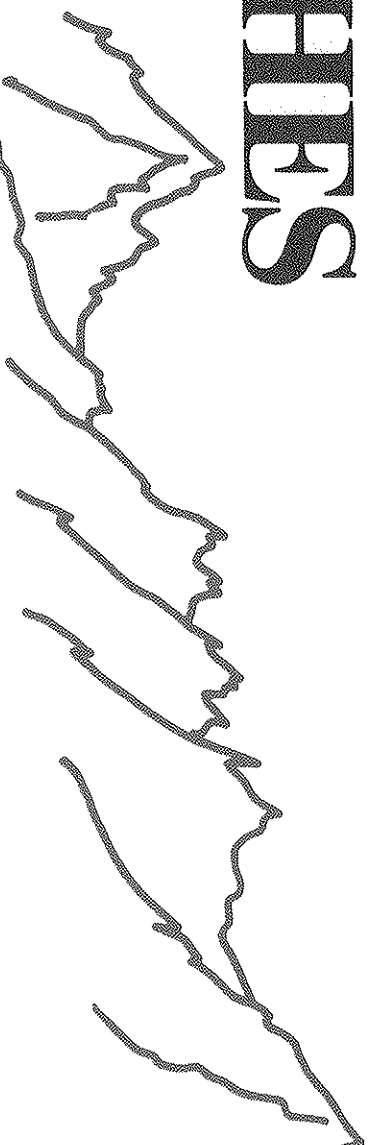
ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE — 74310 LES HOUCHES, FRANCE
Telephone: (33) 50 54 40 69 / Fax: (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before 1 March 1993.

The second 1993 session will be entitled "Cosmology and large scale structure".

Two sessions will be held in 1994, one on "Fields Theory and statistical mechanics of extended objects, the other on "Mesoscopic Systems".

LES HOUCHEs



école d'été de physique théorique

SESSION LX

NATO ADVANCED STUDY INSTITUTE

1^{er} Août — 28 Août 1993

COSMOLOGY AND LARGE SCALE STRUCTURE

*Scientific Direction: R. SCHAEFFER (Saclay, France), J. SILK (U.C. Berkeley, USA),
M. SPIRO (Saclay, France).*

Standard Cosmological Models (Th): A. BLANCHARD, Meudon, France
Standard Cosmological Models (Obs): G. TAMMANN, Basel, Switzerland
Dark Baryonic Matter (Obs): K. FREEMAN, MSSSO, Australia
Dark Baryonic Matter (Th): J. SILK, Berkeley, USA
Very Early Universe: J. ELLIS, CERN, Switzerland
Microwave Background: R. BOND, CITA, Canada
Large Scale Structure (Obs): G. EFSTATHIOU, Oxford, England and V. DE LAPPARENT, IAP, France
Large Scale Structure (Th): E. BERTSCHINGER, MIT, USA and A. SZALAY, Budapest, Hungary
Direct Detection of Dark Matter: B. SADOULET, Berkeley, USA
Galaxy Formation and Evolution: S. WHITE, Cambridge, England
Deep Galaxy Counts: A. TYSON, Bell Labs, USA

Colloquium lectures will be given by: J. BERGERON* (IAP, France), F. BOUCHET (IAP, France), A. BOUQUET (Paris, France), C. CESARSKY (Saclay, France), M. PIERRE* (MPE, Garching), R. JUSZKIEWICZ (N. Copernicus, Poland), P. LENA (Meudon, France), G. RAFFELT (MPI, Munich), J. RICH (Saclay, France), V. RUBAKOV* (Moscow), B. ROCCA-VOLMERANGE (IAP, France), G. SMOOT* (Berkeley, USA), N. VITTORIO (Un. Roma, Italy).
Evening talk: J. AUDOUZE (France).
*to be confirmed.

Over the last few years, galaxy counts in 2 and 3 dimensions and numerous velocity field surveys have become available to provide a unique view of the present universe on large scales. Deep galaxy counts now allow one to tackle the problem of galaxy formation. The discovery of the cosmic microwave background fluctuations and the searches for dark matter in our neighborhood give us for the first time a probe of the conditions prevailing in the very early universe. This school will provide a comprehensive review of these discoveries, their interrelations and their cosmological implications. It is aimed towards young scientists working on these problems, but also towards more experienced astrophysicists and physicists interested in getting a broader view of the field. Seminars by participants and study groups will be organized around the latest developments.

Les Houches is a resort village in the Chamonix valley of the French Alps. Established in 1951, the School is located in a group of mountain chalets surrounded by meadows and woods at an altitude of 1000 m. It is above the village, facing the Mont-Blanc range. It is ideal for mountaineering, hiking or touring as well as for more intellectual work. Accommodation and meals are provided within the School for both participants and lecturers. A financial contribution of FF 3 800 is requested from each participant. Some possibilities for grants exist. Participants who intend to rent lodgings should directly inquire at: Office du Tourisme, 74310 Les Houches (tel. 50 55 50 62). The School is affiliated to the University Joseph Fourier of Grenoble. This session is a NATO Advanced Study Institute and is granted by: "la formation permanente du CNRS".

Admission forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHEs, FRANCE

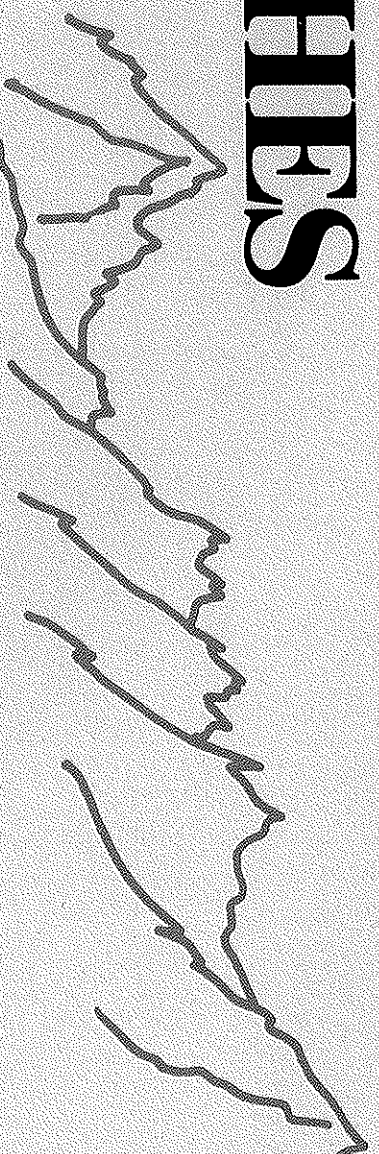
Telephone: (33) 50 54 40 69 / Fax: (33) 50 55 53 25.

Complete files (admission forms and recommendation letters) must have reached this address **before 1 March, 1993.**

The second 1993 session will be entitled "Computational Fluid Dynamics".

Two sessions will be held in 1994, one on "Fields Theory and statistical mechanics of extended objects", the other on "Mesoscopic Systems".

LES HOUCHES



SESSION LXI
NATO ADVANCED STUDY INSTITUTE
June 28 - July 29 1994

école d'été de physique théorique

MESOSCOPIC QUANTUM PHYSICS **PHYSIQUE QUANTIQUE MESOSCOPIQUE**

SCIENTIFIC DIRECTION: **E. AKKERMANS** (Technion, Israël)
G. MONTAMBAUX (Orsay, France)
J.L. PICHARD (Saclay, France)

Quantum Interferences in Disordered and Chaotic Systems: **B. ALTSHULER**, M.I.T., USA
Adiabatic Transport: **J. AVRON**, Technion, Israël
Quantum Interferences and Superconductivity: **C. BEENAKKER**, Leiden, The Netherlands
Experiments on Disordered Metals: **H. BOUCHIAT**, Orsay, France
Single Charge Effects: **M. DEVORET**, Saclay, France
Anderson Insulators: **Y. IMRY**, Weizmann, Israël
Quantum Hall Effects: **A. MACDONALD**, Bloomington, USA
Classical Waves Localization: **G. MARET**, Strasbourg, France
Theory of Random Matrices: **P. MELLO**, U.N.A.M., Mexico
Fermi and Non-Fermi Liquids: **H. SCHULZ**, Orsay, France
Semiclassical Quantization: **U. SMILANSKY**, Weizmann, Israël
Ballistic Transport and Quantum Chaos in Nanostructures: **A.D. STONE**, Yale, USA

Colloquium lectures will be given among others by: **J. BELLISSARD** (Toulouse), **A. BENOIT** (Grenoble), **C. BERGER** (Grenoble), **O. BOHIGAS** (Orsay), **Y. FYODOROV** (Weizmann), **C. GLATTLI** (Saclay), **J. KEATING** (Manchester), **B. KRAMER** (Hamburg), **L. LEVY** (Grenoble), **D. MAILLY** (Bagnex), **S. OUVRY** (Orsay), **M. SANQUER** (Saclay), **M. WILKINSON** (Edimburg).

This session is devoted to a rapidly evolving field of condensed matter physics, dealing essentially with electronic quantum coherence in microstructures. Due to the progress of nanotechnologies, a wealth of new experimental and fundamental questions have emerged, implying the use of new theoretical methods and concepts. Mesoscopics are defined as systems where quantum coherent effects are fully preserved for a macroscopic number of electrons. Their size is intermediate between usual macroscopic systems and those described by atomic physics. This subject has gathered a broad community of physicists from various origins (solid state physics, nuclear physics, field theory, physics of chaos...). The aim of this school is to provide pedagogical lectures on the different fields involved in the problematic of mesoscopic quantum physics and to emphasize the interrelations between them. It is mainly intended for young scientists but also for more experienced physicists interested in getting a broader view of the subject. Seminars by participants will be organized around the latest developments.

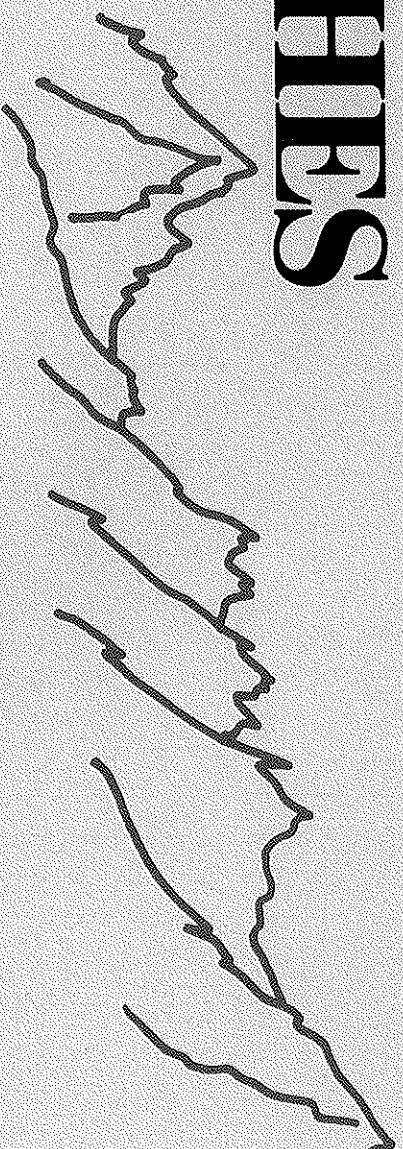
*Les Houches is a resort village in the Chamornix valley of the French Alps. Established in 1951, the School is located in a group of mountain chalets surrounded by meadows and woods at an altitude of 1000 m. It is above the village, facing the Mont-Blanc range. It is ideal for mountaineering, hiking or touring as well as for more intellectual work. Accommodation and meals are provided within the School for both participants and lecturers. A financial contribution of FF 4 600 is requested from each participant. Some possibilities for grants exist. Participants who intend to rent lodging should directly inquire at: Office du Tourisme, 74310 Les Houches (tel. 50 55 50 62). The School is affiliated to University Joseph Fourier and National Polytechnical Institute in Grenoble. It is subsidised by the Ministry of Superior Education and Research, CNRS and the Atomic Energy Commission. This session is a **NATO Advanced Study Institute**.*

Admission forms and additional information are available from:
ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHES, FRANCE
Telephone: (33) 50 54 40 69 / Fax: (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before march 1 1994.

*The second 1994 session will be entitled "Fluctuating Geometries in Statistical Mechanics and Field Theory".
Two sessions will be held in 1995, one on "Quantum Fluctuations", the other on "Quantum Symmetries".*

LES HOUCHEs



SESSION LXII
NATO ADVANCED STUDY INSTITUTE
August 2 - September 9 1994

école d'été de physique théorique

FLUCTUATING GEOMETRIES IN STATISTICAL MECHANICS AND FIELD THEORY

GEOMÉTRIES FLUCTUANTES EN MÉCANIQUE STATISTIQUE ET EN THÉORIE DES CHAMPS

SCIENTIFIC DIRECTION: **F. DAVID** (Saclay, France)
P. GINSPARG (Los Alamos, USA)

Fluctuations in Membranes: **L. PELITI**, Napoli, Italy
Path Integrals in Random Media: **M. KARDAR**, MIT, USA
Defects in Membranes and Directed Polymers: **D. NELSON**, Harvard, USA
Quantum Theory of Many Body Systems: **J. FRÖHLICH**, ETH, Switzerland
Phase Transitions in the Early Universe: **N. TUROK**, Princeton, USA
Random Surfaces and Quantum Gravity: **J. AMBJØRN**, NBI, Denmark
Conformal Field Theory and String Theories: **G. MOORE**, Yale, USA
String Theory and Space Time: **J. POLCHINSKI**, Santa Barbara, USA

Short courses are scheduled on: **Foams** by **D. MUKAMEL** (Weizmann, Israël), **Vortices in Turbulence** by **I. PROCACCIA** (Weizmann, Israël), **Black Holes** by **A. STROMINGER** (Santa Barbara, USA). Colloquium lectures on latest developments and seminars by participants will also be organized.

Many theoretical methods currently employed in statistical mechanics and in quantum field theory have a common underpinning in ideas of universality, phase transitions, and the renormalization group. In recent years there has been important progress in the study of the interplay between the geometry, the dynamics and the fluctuations of extended objects, with applications to quantum gravity, string theories and cosmology as well as statistical mechanics of interfaces, defects and physical membranes. The school aims to provide a common background and language to a mixed audience of young researchers from cosmology and high energy physics and from statistical mechanics and condensed matter physics, and to provide an introduction to active branches of theoretical physics in which these concepts currently play an important role.

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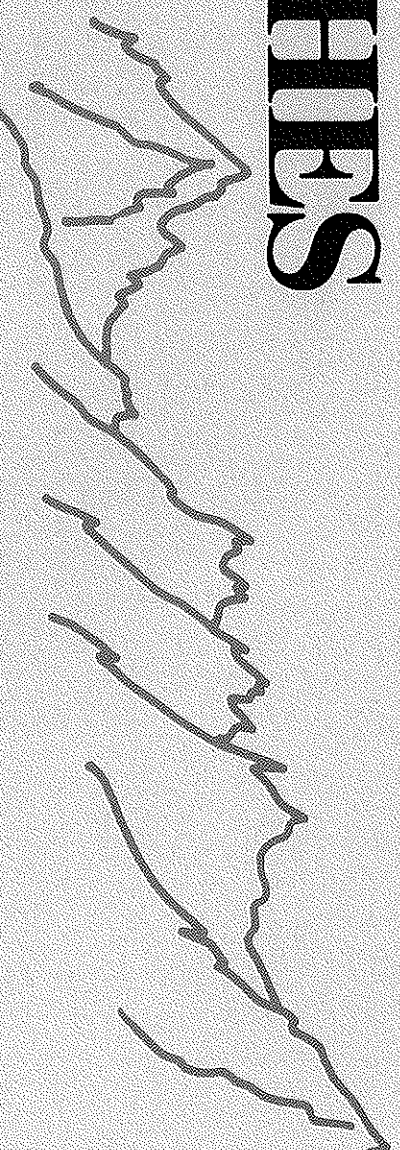
Admission forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHEs, FRANCE
Telephone: (33) 50 54 40 69 / Fax: (33) 50 55 53 25

Complete files (admission forms and recommendation letters) must have reached this address before **march 1 1994**.

*The second 1994 session will be entitled "Mesoscopic Physics".
Two sessions will be held in 1995, one on "Quantum Fluctuations", the other on "Quantum Symmetries".*

LES HOUCHEs



SESSION LXIII
NATO ADVANCED STUDY INSTITUTE
June 27 - July 28 1995

école d'été de physique théorique

QUANTUM FLUCTUATIONS FLUCTUATIONS QUANTIQUES

Scientific Direction: **E. GIACOBINO** (Paris, France),
S. REYNAUD (Paris, France).

Sensitivity in Quantum Measurements: **V.B. BRAGINSKY** (Moscow, Russia)
Quantum Measurement and Quantum Stochastic Methods: **C.W. GARDINER** (Hamilton, New Zealand) and
P. ZOLLER (Boulder, USA)
Quantum Fluctuations in Optical Systems: **P. KNIGHT** (London, UK)
Quantum Fluctuations in Electrical Networks: **M. DEVORET** (Saclay, France)
Sub-Poisson Photon Statistics: **L. DAVIDOVICH** (Rio de Janeiro, Brazil)
Cavity QED and Tests of Quantum Measurement Theory: **S. HAROCHE** and **J.-M. RAIMOND** (Paris, France)
Propagation of Quantum Fields in Dielectrics: **S.M. BARNETT** (Glasgow, UK)
Quantum Fluctuations and Non Linear Optical Patterns: **L. LUGIATO** (Milano, Italy)
Atom Optics: **J. MLYNEK** (Konstanz, Germany)
Quantum Fluctuations and Inertia: **M.T. JAEKEL** (Paris, France)
Vacuum Fluctuations and Cosmology: **L.P. GRISHCHUK** (Saint Louis, USA)
Quantum Chaos: **F. HAAKE** (Essen, Germany)
Spectral Fluctuations in Disordered and Strongly Correlated Metals: **G. MONTAMBAUX** (Orsay, France)

Colloquium lectures on latest developments and seminars by participants will also be organized.

Quantum fluctuations have become a field of great current interest in physics. It is now possible to analyze and modify their effects. New techniques are continuing to be developed to "squeeze" these fluctuations, to measure quantum observables without perturbing their evolution, to manipulate atoms, and to reduce or enhance atomic coupling with radiation fields. Applications have been proposed which may improve the quantum-noise-limited sensitivity of physical measurements. The school aims to gather young physicists working in various fields of quantum optics, quantum electronics, atomic physics, metrology, relativity and cosmology and to provide them with a common background covering theoretical models, experimental methods, and potential applications.

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Admissions forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - F - 74310 LES HOUCHEs
FAX: 33/50.55.53.25

Complete files (admission forms and recommendatory letters) must have reached this address before **March 1, 1995**.

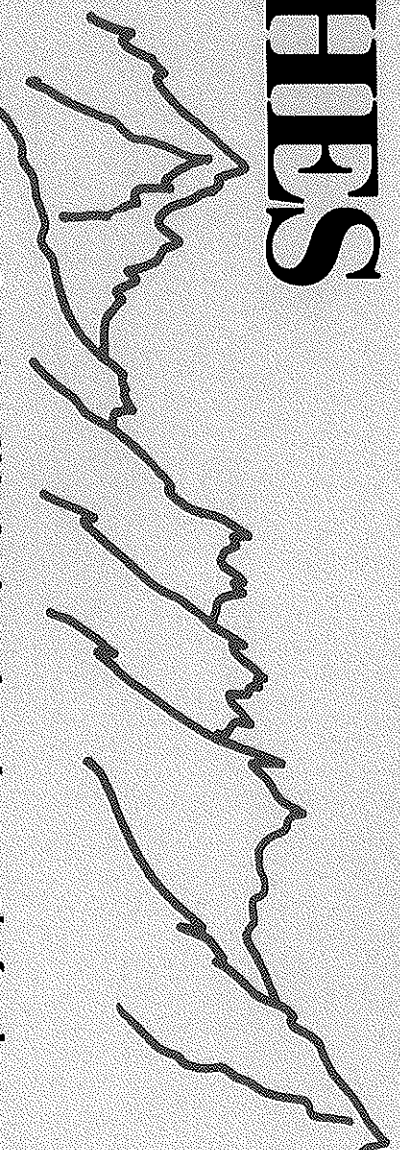
The second 1995 session will be entitled "Quantum Symmetries".
Two sessions will be held in 1996, one on "Biology for physicists", the other on "Trends in Nuclear Physics".

LES HOUCHEs

SESSION LXIV

NATO ADVANCED STUDY INSTITUTE

August 1 - September 8 1995



école d'été de physique théorique

QUANTUM SYMMETRIES SYMÉTRIES QUANTIQUES

Scientific Direction: **A. CONNES** (Collège de France),
K. GAWEDZKI (IHES, Bures-sur-Yvette).

Non-commutative geometry: **A. CONNES** (Paris, France)
Topological field theory and strings: **R. DIJKGRAAF** (Amsterdam, The Netherlands)
Hidden symmetries of integrable models: **L. FADDEEV** (St Petersburg, Russia)
Conformal field theory and integrable systems: **G. FELDER** (Chapel Hill, USA)
Gravity in non-commutative geometry: **J. FRÖHLICH** (Zürich, Switzerland)
Supersymmetric analysis: **A. JAFFE** (Harvard, USA)
Topology of diffeomorphism groups: **J. JONES** (Warwick, England)
Algebraic topology for physicists: **J.L. LODAY** (Strasbourg, France)
Infinite-dimensional quantum symmetries: **T. MIWA** (Kyoto, Japan)
Strings and gravity: **A. POLYAKOV** (Princeton, USA)
Quantum groups and braid groups: **M. ROSSO** (Strasbourg, France)
Compact and non-compact quantum groups: **S. WORONOWICZ** (Warsaw, Poland)

Recent developments in theoretical physics and in mathematics have led to the discovery of new symmetry principles and of new geometry ultimately related to them. These discoveries have stemmed from the study of quantum integrable systems of statistical mechanics, field theory and string theory and from the mathematical development of non-commutative geometry and quantum group theory. The aim of the school is to provide the basic knowledge about these subjects to a mixed audience of young theoretical physicists and young mathematicians interested in quantum symmetries and quantum geometry. The program will concentrate on the current research topics most ripe for cross-fertilization between physics and mathematics.

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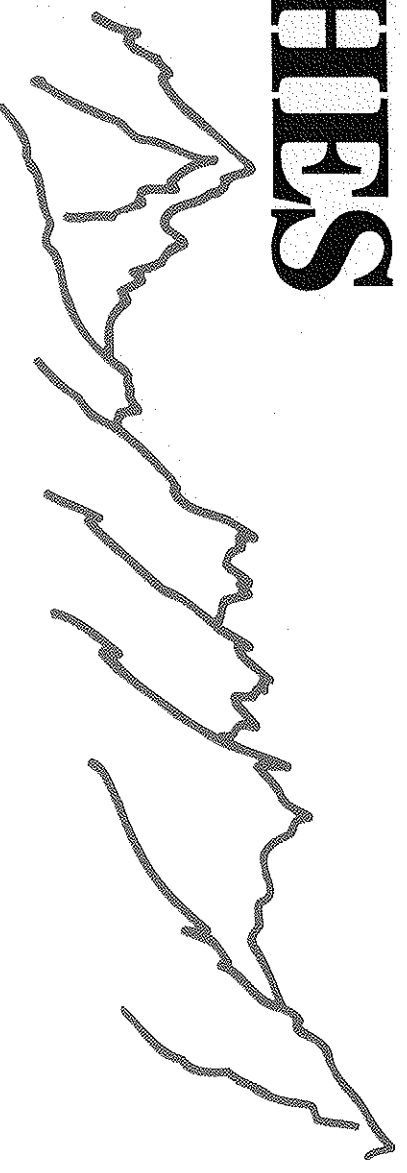
Admissions forms and additional information are available from:

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FAX: 33/50.55.53.25

Complete files (admission forms and recommendatory letters) must have reached this address before **March 1, 1995**.

The second 1995 session will be entitled "Quantum Fluctuations".
Two sessions will be held in 1996, one on "Biology for physicists", the other on "Trends in Nuclear Physics".

LES HOUCHES



SESSION LXV
NATO ADVANCED STUDY INSTITUTE
July 8 - July 26 1996

école d'été de physique théorique

FROM CELL TO BRAIN: THE CYTOSKELETON - INTRA AND INTER-CELLULAR COMMUNICATION - THE CENTRAL NERVOUS SYSTEM DE LA CELLULE AU CERVEAU: LE CYTOSQUELETTE - COMMUNICATIONS INTRA ET INTER-CELLULAIRES - LE SYSTÈME NERVEUX CENTRAL

Scientific Direction:
J. ZACCAI (Grenoble, France),
J. MASSOULIÉ (Paris, France).

The cytoskeleton in morphogenesis; microtubule structure and dynamics *in vitro* and *in vivo*; molecular motors, actin-myosin, kinesin, dynein; genetic approaches to cytoskeleton organisation in yeast, *C. elegans*, transgenic animals; cell cycle and cytoskeleton, trigger and feed-back control mechanisms: **D. JOB** (Grenoble, France); **R. MARGOLIS** (Grenoble, France); **R.R. MCINTOSH** (Boulder, Colorado, USA); **R. WADE** (Grenoble, France).

Functional organisation and internal architecture of a eukaryotic cell; constitutive and regulated mechanisms in secretory and uptake pathways; protein folding and chaperones; concepts of signal recognition; dynamics and identity of subcellular components: **B. GOUD** (Paris, France); **J. MASSOULIÉ** (Paris, France); **D. SABATINI** (New-York, NY, USA).

Ontogeny and phylogeny of representation: evolution of the tetrapod limb; from limb to brain; morphological plasticity in the adult nervous system; quasi redundancy of membrane receptors; from external signal to transcription; time, space and memory: **D. DUBOULE** (Geneva, Switzerland); **A. PROCHIANTZ** (Paris, France); **J.D. VINCENT** (Gif-sur-Yvette, France).

Invited seminars on latest developments: **G. EDELMAN** (San Diego, California, USA); **D. ENGELMAN** (New Haven, Connecticut, USA); **D. GLOVER** (Edinburgh, UK); **U.B. KAUP** (Jülich, Germany); **R. KELLY** (San Diego, California, USA).

The objective of the Session is to provide a review, from an introductory level to latest developments, of the cytoskeleton, intra and inter-cellular traffic and the central nervous system. These topics in Cell Biology have been chosen because they all involve exciting recent progress as well as a potential for new interdisciplinary approaches at the boundary between Physics, Chemistry and Biology (long range dynamic ordering, molecular motors and chaperones, selective membrane transport and two dimensional interactions at membrane surfaces, cell-cell communication in complex ramifications, the development and plasticity of nervous systems...). The topics will be presented with some overlap as a logical progression going from the cell and its internal complexity to highly integrated systems.

Les Houches is a resort village in the Chamonix valley of the French Alps. Established in 1951, the School is located in a group of chalets surrounded by meadows and woods, at an altitude of 1 150 m facing the Mont-Blanc range - a very favourable environment of intellectual activity in ideal surroundings for hiking, mountaineering and sight-seeing. A financial contribution of 3 000 FF is required per participant for accommodation and meals provided within the School, with the possibility of applying for grants to cover all or part of this sum. Participants who prefer to rent lodging should enquire directly to: Office du Tourisme, F-74310 Les Houches, France (Tel. (33) 50.55.50.62). The School is affiliated to the Université Joseph Fourier, Grenoble and the Institut National Polytechnique, Grenoble and is supported by the Ministère de l'Éducation Supérieure et de la Recherche, the Centre National de la Recherche Scientifique (Institut National de Physique Nucléaire et Corpusculaire) and the Commissariat à l'Énergie Atomique (Direction des Sciences de la Matière).

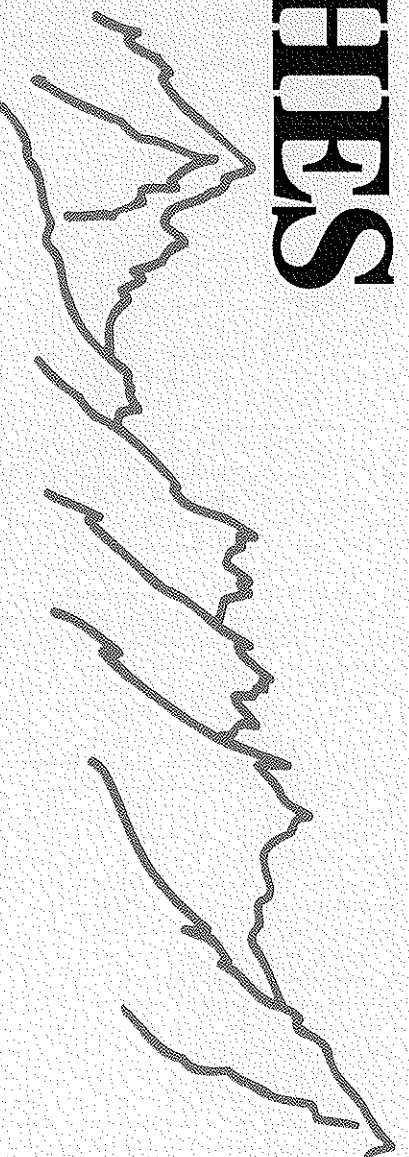
Admission forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - F - 74310 LES HOUCHES
PHONE: 33/50.54.40.69 - FAX: 33/50.55.53.25

Complete applications (admission forms and letters of recommendation) must have reached this address before March 1, 1996.

Two sessions are Foreseen in 1997: "Climate Modeling and Variability", "Modèle standard en physique des particules".

LES HOUCHEs



SESSION LXVI
July 30 - August 30 1996

école d'été de physique théorique

TRENDS IN NUCLEAR PHYSICS, 100 YEARS LATER OÙ EN ÉST LA PHYSIQUE NUCLÉAIRE APRÈS 100 ANS D'EXISTENCE ?

Scientific Direction:

H. NIFENECKER (ISN Grenoble France),
J.P. BLAZOT (CE Saclay France),
G. BERTSCH (Un. of Washington USA),
W. WEISE (T.U. München Germany).

Introduction to QCD: **A. Mueller** (Columbia Un., N.Y. USA)
Nuclear Structure: **B. MOTTELSON** (N.B.I. Copenhagen, DK)
The physics of the Quark-Gluon Plasma: **J.P. BLAZOT** (CE Saclay, FR)
Collective excitations: **G. BERTSCH** (Un. Washington, USA)
Hadrons and Nuclei: **W. WEISE** (T.U. München, D)
Electromagnetic and weak interactions in nuclei: **B. DESPLANQUES** (ISN Grenoble, FR)
Excited nuclear matter: **U. MOSEL** (Un. GIESSEN, D)
Phase transition phenomena: **X. CAMPI** (IPN Orsay, FR)
Multifragmentation: **B. TAMAIN** (Un. Caen, FR)
Energy production with accelerators: **C. RUBBIA** (CERN Geneva, CH)
Synthesis of very heavy nuclei: **P. ARMBRUSTER** (GSI Darmstadt, D)
Nuclear astrophysics: **C. PETHICK** (NORDITA Copenhagen, DK)
In addition to the general courses, a number of more specific lectures or seminars will be given, either by invited speakers or by school-attendants.

In 1996 Nuclear Physics will be 100 years old. This centenarian is still a most active and lively discipline with many recent developments and new challenges. Radioactive beams and advanced detectors give new impetus to nuclear structures studies. New electron facilities explore the deep interior of hadrons as well as the role of subnuclear degrees of freedom in nuclei. Heavy ion collisions, from moderate to the highest achievable energies, allow the investigation of the densest forms of matter and the transition to the quark-gluon plasma. A profound unity, beyond the specialisation of the various subfields, can be found in Nuclear Physics today. It is a field of research which exhibits essentially all manifestations of strongly interacting, finite fermionic systems. The aim of the School is to provide a unified presentation of both the main experimental developments and the new theoretical tools in the field. The School will be open to advanced graduate students as well as to more senior physicists.

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Admissions forms and additional information are available from:

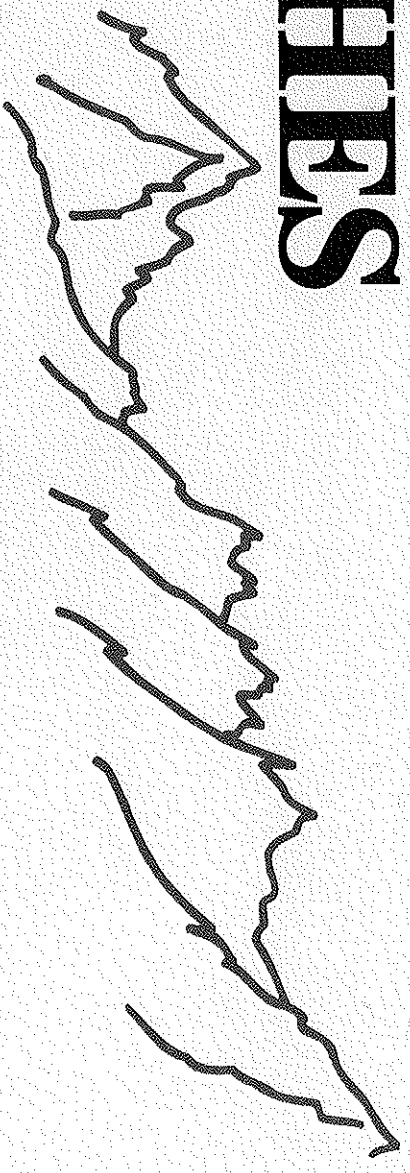
ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - F - 74310 LES HOUCHEs
FAX: 33/50.55.53.25 - INFORMATION ON SCIENTIFIC PROGRAM : nif@frcpn11.in2p3.fr

Complete files (admission forms and recommendatory letters) must have reached this address before **March 1, 1996**.

The first 1996 session will be entitled "Topics in Cell Biology for the development of Physical Approaches: from Cell to Central Nervous System".

Two sessions will be held in 1997, one on "Climate Modeling and Variability", the other on Standard model in Particles Physics".

LES HOUCHEES



SESSION LXVII
NATO ADVANCED STUDY INSTITUTE
June 30 - July 25 1997

école d'été de physique théorique

"MODELING THE EARTH'S CLIMATE AND ITS VARIABILITY" "MODÉLISATION DU CLIMAT DE LA TERRE ET DE SA VARIABILITÉ"

Scientific Direction: **William R. HOLLAND** (NCAR, USA),
Sylvie JOUSSAUME (CNRS, LMCE, France),

- The Observed Climate System : **E. RASMUSSEN** (U. Maryland, USA)
- Atmospheric Modeling and Climate Variability : **L. BENGTTSSON** (MPI, Hamburg, Germany)
- Ocean Modeling and the Role of the Ocean in Climate Change : **P. DELECLUSE** (LODYC, France)
- Past Climate Variations and the Mechanisms of Climate Change : **J.C. DUPLESSY** (CFR, France)
- Modeling Long Term Climate Change : **T.J. CROWLEY** (Texas Univ., USA).

In addition to these general courses, a number of more specific lectures or seminars will be given, either by invited speakers or by school-attendees. In particular, lectures will include such topics as the role of biogeochemical cycles in the climate system (**W. BROECKER**, LDGO, USA), aspects of decadal variability and the importance of greenhouse gas scenarios for understanding future climate change (**S. MANABE**, GFDL, USA), the contribution of satellite observations to oceanography (**J.F. MINSTER**, GRGS, France).

Understanding the climate of planet Earth and particularly its variability on both short and long time scales is a daunting but essential task. The problem is difficult because it is made up of a complex set of interactions between the components of the physical system—the atmosphere, the ocean, land processes and ice—and the chemical and biological systems that contribute to climate equilibrium. The basis for our present understanding relies upon indirect evidence from past climatic states, direct observations of the present climate, and the use of sophisticated numerical models of the fluid dynamical behaviors of the global ocean and the atmosphere. Recently, coupled climate system models that include many or all of these subcomponents have been developed, allowing scientists to investigate past climate scenarios, present climate variability, and future climate predictions. The aim of the school is to provide a thorough presentation of both the observations and the models that are necessary to rationalize the complex behavior of the climate system. The school will be open to advanced graduate students as well as to more senior researchers in climate studies, including atmospheric scientists, oceanographers, and paleoclimate researchers.

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Admission forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - F - 74310 LES HOUCHEES

PHONE: +33-4-50 54 40 69 - FAX: +33-4-50 55 53 25

E-MAIL: secretariat.houches@ujf-grenoble.fr W3:<http://www.ujf-grenoble.fr/HOUCHES/>

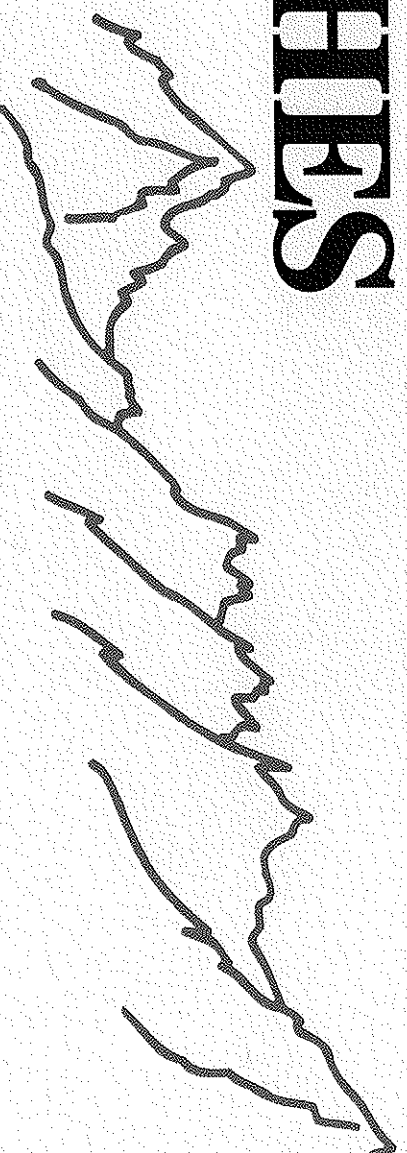
Please if you asked for admission forms by e-mail, mention your mailing address or fax number.

Complete files (admission forms and letters of recommendation) must have reached this address before **March 1, 1997**.

The second 1997 session will be entitled "Probing the standard model of particle interactions".

Two sessions will be held in 1998, one on "Topological aspects of low dimensional systems", the other on "Infrared Space Astronomy".

LES HOUCHEES



SESSION LXVIII
NATO ADVANCED STUDY INSTITUTE
July 28 - September 5 1997

école d'été de physique théorique

"PROBING THE STANDARD MODEL OF PARTICLE INTERACTIONS" "PARTICULES ET INTERACTIONS: LE MODÈLE STANDARD MIS À L'ÉPREUVE"

Scientific Direction:

Rajan GUPTA (Director) (Los Alamos, USA),
André MOREL (Saclay, FR),
Eduardo DE RAFAEL (Marseille, FR).

Electroweak model and LEP physics: Daniel TREILLE (CERN, CH)
Effective weak hamiltonian and CP violation: Andrzej BURAS (Munich, D)
Effective field theories in the light and heavy quark limits: Toni PICH (Valencia, E)
Lattice QCD: (to be announced)
Perturbative QCD in soft and hard processes: David A. KOSOWER (Saclay, FR)
Deeply inelastic scattering: Aneesh MANOHAR (UC San Diego, USA)
Experimental K physics: Louis FAYARD (LAL-Orsay, FR)
Physics at the LHC: Friedrich DYDAK (CERN, CH)
Experimental D and B physics: Jeff RICHMAN (UC Santa Barbara, USA)
QCD at finite temperature: Jean-Paul BLAIZOT (Saclay, FR)
Models of electroweak breaking: Sekhar CHIVUKULA (Boston U., USA)
An update on supersymmetry developments: Graham ROSS (U. of Oxford, GB)
Duality in supersymmetric gauge theories: Paolo DI VECCHIA (Nordita, DK)
Recent developments in Lattice QCD: Martin LÜSCHER (DESY, D)
Heavy quark symmetry: Mark WISE (Caltech, USA)
A few additional lectures or seminars will be given, either by invited speakers or by school attendants.

The standard model of particle interactions has, since its formulation in the early seventies, remained the only serious candidate theory describing three (weak, electromagnetic and strong) of the four forces of nature. All present experimental data are consistent with this theory, however our understanding of the SM is far from complete. There are too many arbitrary parameters like the masses and mixing angles of the quarks. A serious limitation to obtaining accurate values for these parameters is the large uncertainties in quantitative estimates of strong interaction effects in regimes which are governed by the non-perturbative behaviour of the underlying theory, QCD. Thus, over the last twenty years a number of techniques have been developed to obtain quantitative predictions from the standard model. These include perturbative QCD calculations, lattice QCD, chiral perturbation theory, large N_c QCD sum rules, heavy quark effective theory, and approaches based on simple models that cannot be derived from QCD. The aims of the school are to provide an introduction to the different theoretical approaches and assess their relative strengths and successes, to summarize the existing and planned experiments and the results expected from them, and finally to discuss the important open problems and tests of the SM for which there will be experimental input during the next decade. The School will be open to advanced graduate students and young researchers.

Les Houches is a resort village in the Chamornix valley of the french Alps. Established in 1951, the School is located in a group of mountain chalets surrounded by meadows and woods at an altitude of 1 150 m. It is above the village, facing the Mont-Blanc range. It is ideal for mountaineering, hiking or touring as well as for more intellectual work. Accommodation and meals are provided within the School for both participants and lecturers. A financial contribution of FF 6800 is requested from each participant. Some possibilities for grants exist. Participants who intend to rent lodging should inquire directly at: Office du Tourisme, F-74310 Les Houches (tel. +33-4-50 55 50 62). The School is affiliated to the University Joseph Fourier and Institut National Polytechnique de Grenoble. It is subsidized by the MENESR, CNRS and the Commissariat à l'Energie Atomique.

Admission forms and additional information are available from:

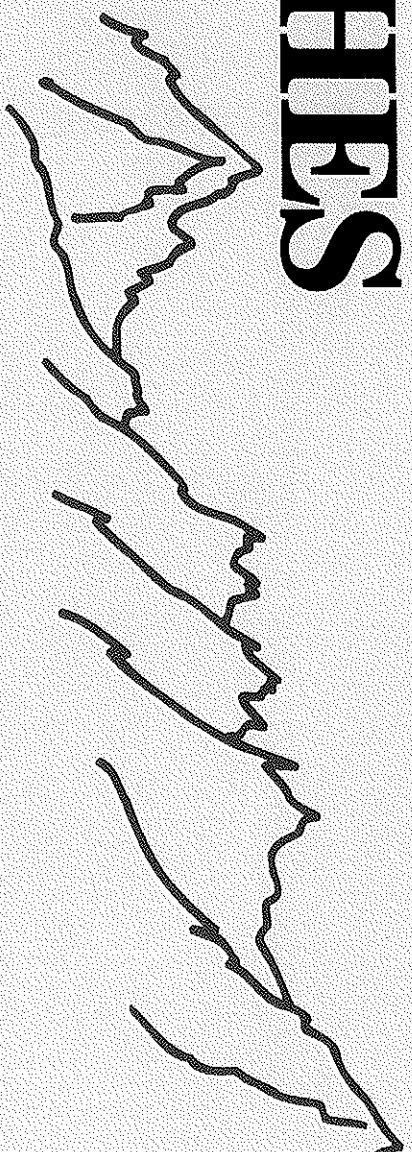
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PHONE: +33-4-50 54 40 69 - FAX: +33-4-50 55 53 25
E-MAIL: secretariat.houches@ujf-grenoble.fr W3: <http://www.ujf-grenoble.fr/HOUCHEES/>

Please if you asked for admission forms by e-mail, mention your mailing address or fax number.

Complete files (admission forms and letters of recommendation) must have reached this address before **March 1, 1997**.

The first 1997 session will be entitled "Modeling the earth's climate and its variability".
Two sessions will be held in 1998, one on "Topological aspects of low dimensional systems", the other on "Infrared Space Astronomy".

LES HOUCHEs



SESSION LXIX
NATO ADVANCED STUDY INSTITUTE
July 7 - 31, 1998

école d'été de physique théorique

"TOPOLOGICAL ASPECTS OF LOW DIMENSIONAL SYSTEMS" "ASPECTS TOPOLOGIQUES DE LA PHYSIQUE DE BASSE DIMENSION"

Scientific Direction:

Alain COMTET (DPT-IPN, Orsay, France),
Thierry JOLICOEUR (SPHT, CEA Saclay, France),
Stéphane OUVRY (DPT-IPN, Orsay, France).

Introduction of Topological Numbers : **D.J. THOULESS** (U. Washington, Seattle, USA)
The Quantum Hall Effect : **S.M. GIRVIN** (U. Bloomington, Bloomington, USA)
Experimental Aspects of the Quantum Hall Effect and Related Phenomena : **M. SHAYEGAN** (U. Princeton, Princeton, USA)
Edge States : **M.P.A. FISHER** (ITP, UCSB, Santa Barbara, USA)
Exact Correlations and Transport Properties in Quantum Impurity : **H. SALEUR** (USC, Los Angeles, California, USA),
Anyons : **J. MYRHEIM** (U. Trondheim, Trondheim, Norway),
Intermediate Statistics in $d=1$: **A. POLYCHRONAKOS** (U. Uppsala, Uppsala, Sweden),
Aspects of Chern-Simons Theory : **G. DUNNE** (U. Connecticut, Storrs, USA),
Topological Statistical Mechanics of Polymers : **B. DUPLANTIER** (CEA-Saclay, France),
Statistics of Knots and entangled Random Walks : **S. NECHAEV** (Landau Institute, Moscow, Russia).

A few additional lectures or seminars will be given, either by invited speakers or by school attendants.

The purpose of the school is to introduce young scientists to the study of quantum systems in low dimensions. In the past years, this field has been the subject of numerous theoretical and experimental works. Among the most notorious, let us mention, in condensed matter, the integer and fractional quantum Hall effects, quantum spin chains, polymers, mesoscopic systems in low dimensions. These topics require a wide range of modern theoretical methods, such as field theory, statistical mechanics, and topology. The quantum Hall effect will be a central topic; related subjects such as anyons, one dimensional statistics, statistical mechanics of polymers, etc... will also be discussed.

The school will be open to advanced graduate students and young researchers. Attendance is limited to 50 students.

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Admission forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - F - 74310 LES HOUCHEs
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E-MAIL: secretariat.houches@ujf-grenoble.fr W3:http://w3houches.ujf-grenoble.fr

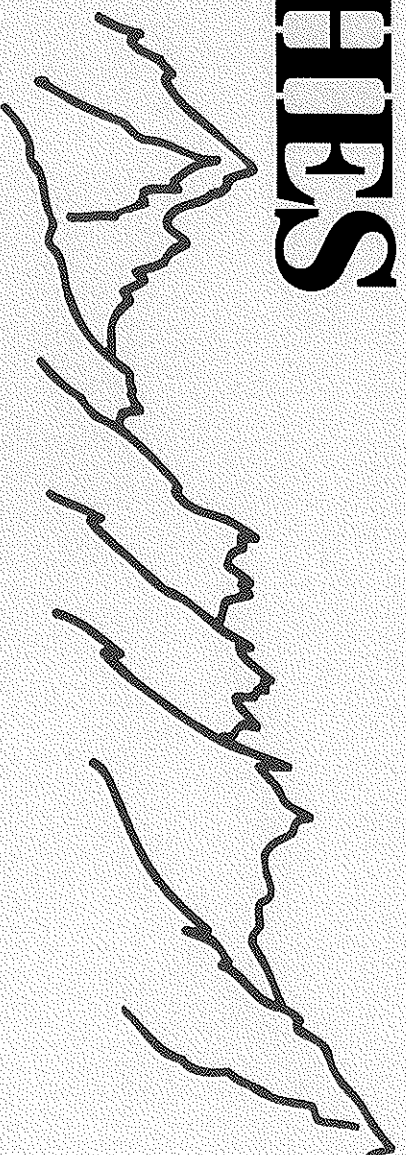
Please if you asked for admission forms by e-mail, mention your mailing address or fax number.

Complete files (admission forms and letters of recommendation) must have reached this address before **March 1, 1998**.

Do not send application forms by e-mail ! In case of emergency, use fax. A selection committee (Scientific Directors of the session and Direction of the School) will select the candidates.

The second 1998 session will be entitled "Infrared Space Astronomy, Today and Tomorrow".
Two sessions will be held in 1999, one on "The Primordial Universe", and one on "Atomic Matter waves, Coherence and Decoherence".

LES HOUCHEs



école d'été de physique théorique

SESSION LXX
NATO ADVANCED STUDY INSTITUTE
August 4 - 28, 1998

"INFRARED SPACE ASTRONOMY, TODAY AND TOMORROW" "ASTRONOMIE SPATIALE INFRAROUGE, AUJOURD'HUI ET DEMAIN"

Scientific Direction: **Fabienne CASOLI** (Observatoire de Paris, France),
James LEQUEUX (Observatoire de Paris, France).

General presentation of infrared astronomy : **M. HARWIT** (USA)
The Infrared Space Observatory (ISO) : **M. KESSLER** (ASE, Spain) and **J.L. STARCK** (CEA, France)
Solar system : **T. ENCRENAZ** (Observatoire de Paris, France)
Stars and galactic structure : **H. HABING** (Leiden Observatory, The Netherlands)
Interstellar matter and star formation : **F. BOULANGER** and **P. COX** (IAS, France), **A. NATTA** (Arcetri Observatory, Italy)
Normal galaxies : **G. HELOU** (IPAC, Cal Tech, USA)
Active galaxies : **R. GENZEL** (MPE, Germany)
Cosmology : **J.L. PUGET** (IAS, France)

In addition to these general courses, time will be reserved for practical work on actual data from the Infrared Space Observatory (ISO), using workstations and appropriate softwares. A number of more specific lectures will be given, either by invited speakers or school attendees. In particular, future facilities for infrared and submillimeter astronomy will be presented.

All celestial bodies emit in the infrared, and half of the radiation of galaxies lies in this wavelength range. This domain is crucial for studies of the solar system, of stars at the beginning and the end of their lives, of interstellar matter, of nearby as well as very distant galaxies. Recent developments of observational techniques have been tremendous; one airborne observatory and two satellites, IRAS and ISO, have been dedicated to this domain, and many more are to come.

The purpose of this school is to attract a new community of scientists, from graduate students to senior researchers, to this field of research. They will learn the bases of infrared astronomy, and how to use the archival data of ISO. This will help to prepare themselves for the many future infrared and submillimeter space facilities: ODIN (launched in 1998), SWAS (1998), WIRE (1998), MAP (2000), SOFIA (2001), SIRTf (2001), IRIS (2002), PLANCK/FIRST (2005) etc.

The School will be open to graduate students and researchers. Attendance is limited to 50 students.

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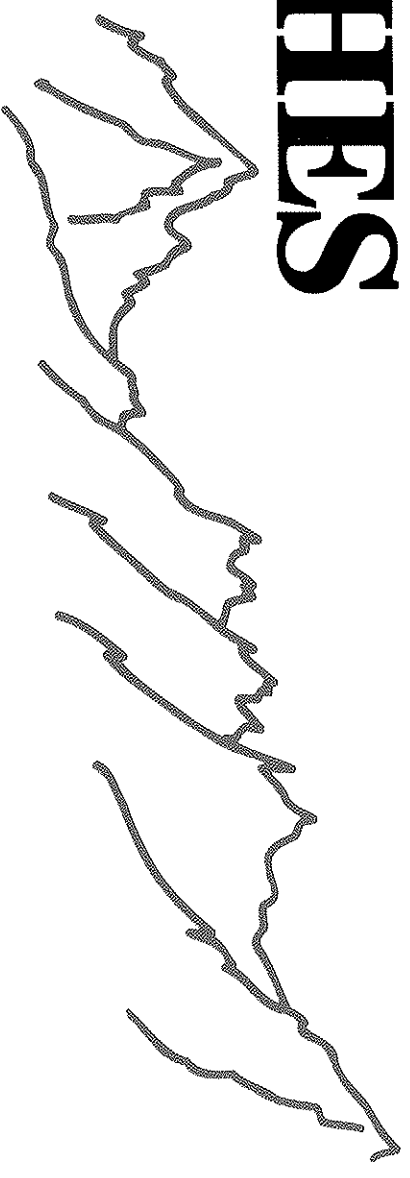
Please if you asked for admission forms by e-mail, mention your mailing address or fax number.

Complete files (admission forms and letters of recommendation) must have reached this address before **March 1, 1998**.

Do not send application forms by e-mail ! In case of emergency, use fax. A selection committee (Scientific Directors of the session and Direction of the School) will select the candidates.

The first session of 1998 will be entitled "Topological Aspects of Low Dimensional Systems".
Two sessions will be held in 1999, one on "The Primordial Universe", and one on "Atomic Matter waves, Coherence and Decoherence".

LES HOUCHES



SESSION LXXI

école d'été de physique théorique

THE PRIMORDIAL UNIVERSE L'UNIVERS PRIMORDIAL

June 28 - July 23, 1999

Scientific Direction:

Pierre Binétruy (Orsay U., France)

Richard Schaeffer (Saclay, France)

Joseph Silk (Berkeley U., CA, USA)

Introduction to Supersymmetry, Astrophysical and Phenomenological Constraints, **K. OLIVE** (U. of Minnesota Minneapolis, USA)
Large Scale Structure of the Universe, **A. STEBBINS** (Fermilab, Batavia, USA)
The Universe at High Redshift *, **S. LILLY** (U. of Toronto, Canada)
The Early Universe: Baryogenesis, Defects, and Initial Conditions, **N. TUROK** (Cambridge U., Grande Bretagne)
Quantum Gravity, Superstrings and M-Theory, **T. BANKS** (Rutgers U., USA)
The CMB fluctuations, **J.-L. PUGET** (Orsay U., France)
Inflation and Primordial Fluctuations, **A. LINDE** (Stanford U., USA)
Dark Matter: Direct Detection, **G. CHARDIN** (Saclay, France)
Superstring Cosmology: the Pre-Big Bang Scenario, **G. VENEZIANO** (CERN, Switzerland)

In addition to the lectures, time will be reserved for seminars on recent development in the fields covered by this school.

In the last 20 years the ties between Particle Physics and Astrophysics have become much closer. Our modern concepts of the physics of fundamental interactions turn out to have important cosmological consequences. This school will review what has been learned from these connections, and introduce the most recent topics in the field. The interface between Particle Physics and Astrophysics is getting a new boost from ideas about the description of the elementary interactions in connection with inflation and quantum gravity. On the observational side, the limits on the cosmological parameters have noticeably tightened. The bounds on a possible population of dark compact objects in our Galaxy will soon be quantified. Also, sensitive experiments of direct and indirect detection of dark matter in the form of weakly interacting elementary particles are underway. This school will focus on the Universe before Nucleosynthesis. It is specially addressed to the community at the interface between astrophysics and particle physics and is aimed typically at advanced doctoral or postdoctoral students. The courses, however, are organized so that astrophysicists as well as physicists from neighboring fields can step in and benefit.

The School will be open to graduate students and researchers. Attendance is limited to 50 students. A financial contribution of 5600 FF (853.71 €) is required from each participant. It covers full lodging and meals at the School, and includes the published lecture notes. The School may provide a few grants, to cover part or all the living expenses and eventually travel expenses. Applications for grants must be sent in advance to the School. Except for some specific cases, the grant allocations (depending of course on the session funding) will be made at the beginning of the session. Application forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHES, FRANCE

Phone: +33 - 4 50 54 40 69 - Fax: +33 - 4 50 55 53 25

E-mail: secretariat.houches@ujf-grenoble.fr WS: <http://w3houches.ujf-grenoble.fr/>

The required documents (application form + 2 recommendation letters) must be sent by ordinary mail to the School before **March 1, 1999** (please if you ask for application form by e-mail, mention your mailing address or fax number). The selection committee (Scientific Directors of the session and Direction of the School) will select the candidates.

Les Houches is a resort village in the Chamoniix valley in the French Alps. Established in 1951, the Physics School is located in a group of chalets surrounded by meadows and woods, at an altitude of 1150 m facing the Mont-Blanc range - a very favorable environment of intellectual activity in ideal surroundings for hiking, mountaineering and sight-seeing. Participants who would prefer to rent lodging in the village should enquire directly to Office du Tourisme, 74310 Les Houches, France (Tel. +33 - 4-50 55 50 62, Fax +33 - 4 50 55 53 16, E-mail: ot.les.houches@wanadoo.fr).

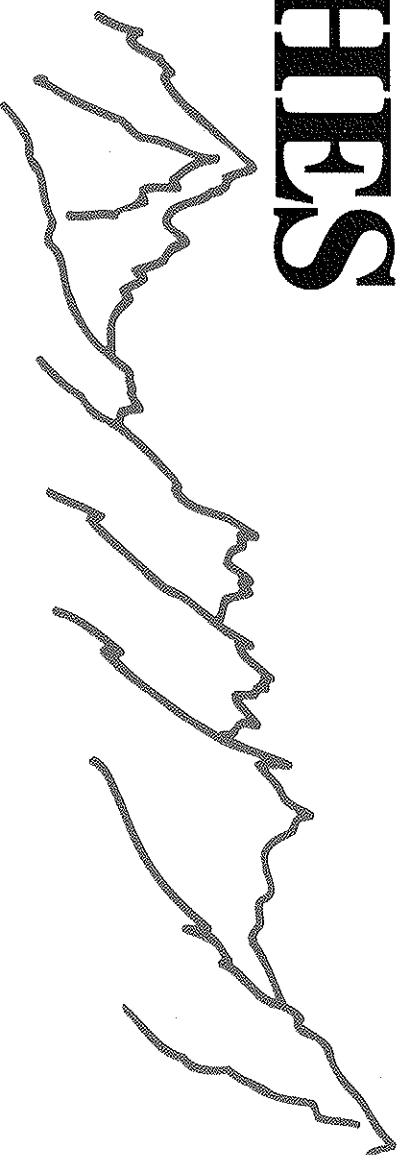
The Les Houches Physics School is affiliated to the Université Joseph Fourier and to the INPG in Grenoble, and is supported by MENRT, CNRS and CEA. This session is supported by CNRS, CEA, PNC, NSF & NASA.

The August 1999 Summer School Session is entitled "Coherent Atomic Matter Waves". Two sessions are scheduled for 2000, one on "Clusters and Nanoparticles", the other on "Turbulence".

Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches.

Director: François DAVID

LES HOUCHES



SESSION LXXII
NATO ADVANCED STUDY INSTITUTE

école d'été de physique théorique

COHERENT ATOMIC MATTER WAVES ONDES DE MATIÈRE COHÉRENTES

July 27 - August 27, 1999

Scientific Direction:

Robin Kaiser (Institut Non Linéaire de Nice, France)
Christoph Westbrook (Institut d'Optique, Orsay, France)

Bose condensed atomic gases: simple theoretical results: **Y. Castin** (LKB-ENS, France)
Nonequilibrium phenomena in trapped atomic gases: **H. Stoof** (U. Utrecht, Netherlands)
Techniques and results of experimental Bose-Einstein Condensation: **E. Cornell** (JILA, Boulder, USA)
Experimental studies of Bose-Einstein condensates: **W. Ketterle** (MIT, Cambridge, USA)
Decoherence, the quantum-classical transition, and the physics of information: **J. Paz** (Buenos Aires, Argentina) & **W. Zurek** (Los Alamos, USA)
Cavity QED Experiments, entanglement and quantum measurement: **M. Brune** (LKB-ENS, France)
Atom interferometry: **S. Chu** (U. Stanford, USA)
Quantum and nonlinear optics in a photonic band gap: **S. John** (U. Toronto, Canada)
Applications of multiple scattering concepts in atomic physics: **B. van Tiggelen** (IJF, Grenoble, France)
Quantum chaos and atomic physics: **D. Delande** (LKB-ENS, France)

In addition to the lectures, time will be reserved for seminars on recent development in the fields covered by this school.

Rapid progress is being made in the study of quantum effects in atomic systems. Due largely to the development of laser cooling during the years 1980-1990 the 1990's have witnessed several breakthroughs: Bose Einstein condensation, the production of "Schrödinger cat states", and the beginning of the study of the propagation of atomic de Broglie waves in complex media which exhibit chaos, localization etc. This school is intended to bring together several leading researchers in these areas to give a series of lecture courses aimed at advanced doctoral and post-doctoral students in order to familiarize them with the frontiers of this research.

The School will be open to graduate students and researchers. Attendance is limited to 50 students.

A financial contribution of **5900 FF** is required from each participant. It covers full lodging and meals at the School, and the published lecture notes. The School will provide a few grants, which may cover part or all the living expenses and possibly travel expenses. Applications for grants must be sent in advance to the School. The final decisions (depending of course on the session funding) will be made at the beginning of the session.

Application forms and additional information are available from:

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE - 74310 LES HOUCHES, FRANCE
Phone: +33 - 4 50 54 40 69 - Fax: +33 - 4 50 55 53 25
E-mail: secretariat.houches@ujf-grenoble.fr W3: <http://w3houches.ujf-grenoble.fr/>

The required documents (application form + 2 recommendation letters) must be sent by ordinary mail to the School **before March 1, 1999** (please if you asked for application form by e-mail, mention your mailing address or fax number). The selection committee (Scientific Directors of the session and Direction of the School) will select the candidates.

Les Houches is a resort village in the Chamoniix valley in the French Alps. Established in 1951, the Physics School is located in a group of chalets surrounded by meadows and woods, at an altitude of 1150 m facing the Mont-Blanc range - a very favorable environment of intellectual activity in ideal surroundings for hiking, mountaineering and sight-seeing. Participants who would prefer to rent lodging in the village should enquire directly to Office du Tourisme, 74310 Les Houches, France (Tel. +33 - 4 50 55 50 62, Fax +33 - 4 50 55 53 16, E-mail: ot.les.houches@wanadoo.fr).

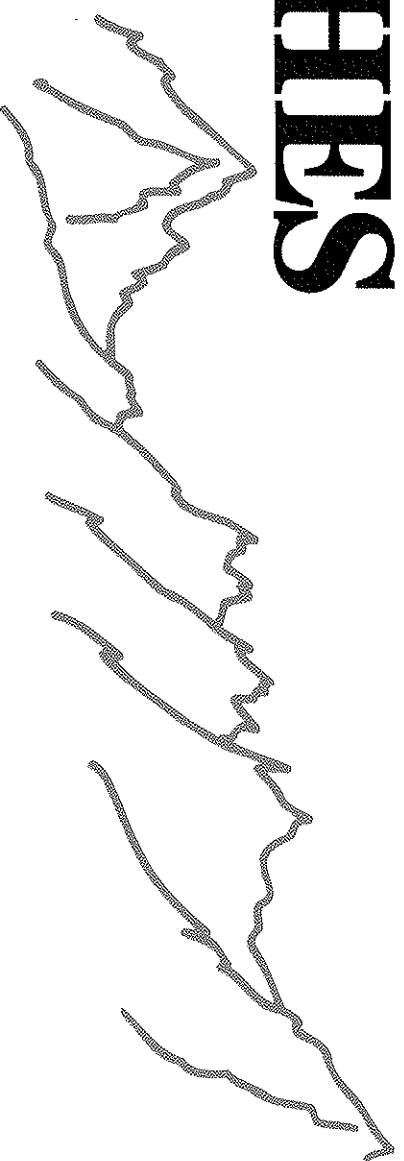
The Les Houches Physics School is affiliated to the Université Joseph Fourier of Grenoble and to the Institut National Polytechnique de Grenoble, and is supported by the Ministère de l'Éducation Nationale, de la Recherche et de la Technologie (MENESR), the Centre National de la Recherche Scientifique (CNRS) and the Direction des Sciences de la Matière of the Commissariat à l'Énergie Atomique (CEA). This session is supported by the NATO ASI program.

The July 1999 Summer School session will be entitled "The Primordial Universe". Two sessions are scheduled for 2000, one on "Clusters and Nanoparticles", the other on "Turbulence".

Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches.

Director: François DAVID

LES HOUCHES



SESSION LXXIII
NATO ASI
European High Level Scientific Conference

École d'été de physique théorique

ATOMIC CLUSTERS AND NANOPARTICLES AGRÉGATS ATOMIQUES ET NANOPARTICULES July 3 - July 28, 2000

Scientific Direction:

Claude Guet (CEA Grenoble, France)
Pavel Hobza (J. Heyrovsky Institute of Physical Chemistry, Prague, Czech Republic)

Lecturers:

Electronic properties of clusters: **G. Bertsch** (U. Seattle, USA)
Semiclassical approaches to mesoscopic systems: **M. Brack** (U. Regensburg, Germany)
Confinement techniques for simulating finite many-body systems: **S. Chekmarev** (Inst. Thermophysics, Novosibirsk, Russia)
Pairing correlations in finite systems: atomic nuclei and metallic clusters: **H. Flocard** (U. Orsay, France)
Experimental investigations of thermodynamical properties of metallic clusters: **H. Haberland** (U. Freiburg, Germany)
Physical and chemical processes in nano and mesoscale systems and their size evolution: **U. Landman** (U. Atlanta, USA)
Condensed matter physics approach to nanosystems: **M. Manninen** (U. Jyväskylä, Finland)
Experimental studies of atomic clusters: **T. P. Martin** (MPI Stuttgart, Germany)
Magnetism of Clusters: **G. Pastor** (U. Paul Sabatier, Toulouse, France)
Cooperativity effects in quantum chemistry: **L. Piela** (U. Warsaw, Poland)
Density functional theory for small systems: **D. Salahub** (U. Montreal, Canada)
Electron scattering on clusters: **A. Soloviev** (Ioffe Institute, St Petersburg, Russia)
Complex energy surfaces and thermodynamics of clusters: **D. Wales** (U. Cambridge, England)

Scientific Context:

Since about 20 years interest has grown very fast in the study of atomic and molecular clusters as well as nanoparticles such as quantum dots. The small size and the finite number of constituents lead to novel structural and thermodynamic properties with no equivalent in the bulk. The physics and chemistry of clusters remains a largely interdisciplinary subject. The present school will take advantage of this interdisciplinarity with outstanding lecturers having their background in atomic and molecular physics, condensed matter physics, nuclear physics, chemistry and physical chemistry, and last but not least computational physics.

The school aims at providing advanced doctoral and post-doctoral researchers with the state of the art of theoretical concepts and methods. In addition to the already confirmed lectures there will be additional lectures and seminars on recent developments in the fields covered by this school. There will be plenty of time for personal work, discussions, organizing small working groups and to get to know each other.

Scientific Committee: **Claude Guet** (Grenoble, France), **Pavel Hobza** (Prague, Czech Republic), **Steve Berry** (Chicago, USA), **Joshua Jortner** (Tel Aviv, Israel), **Fernand Spiegelmann** (Toulouse, France)

Inscriptions:

Applications must be send to the School **before March 1, 2000**. A selection committee will select the participants. A financial contribution is requested from each participant (FF 4500 - € 686). It covers accommodation and meals, which are provided within the School for both participants and lecturers. Possibilities of grants exist, in particular for students from Eastern Europe and developing countries. Application forms and additional information are available from:

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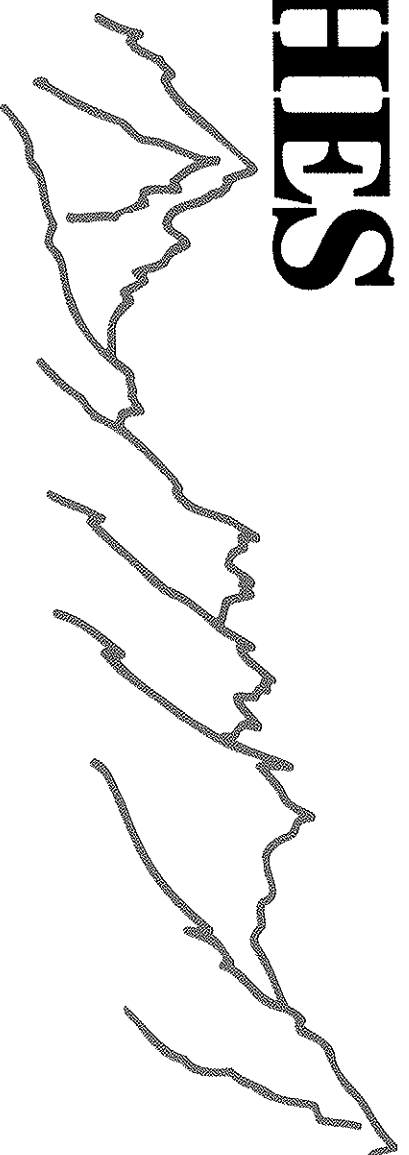
This session has received the financial support from the **NATO Advanced Study Institute (ASI) Program** and from the **European Commission High-Level Scientific Conferences (HLSC) Program**

Two sessions are scheduled for 2001, one on "Physics of Biomolecules and Cells", the other on "Gravity, Gauge Theory and Strings"

Ecole de Physique des Houches, Côte des Chavants, F-74310 les Houches

Director: François David

LES HOUCHES



SESSION LXXIV
NATO ASI
European High Level Scientific Conference

École d'été de physique théorique

NEW TRENDS IN TURBULENCE TURBULENCE: NOUVEAUX ASPECTS July 31 - September 1, 2000

Scientific Direction: Marcel LESIEUR (LEGI-Grenoble, France)
Akiva YAĞLOM (Institute of Atmospheric Physics, Moscow, and MIT)

Lecturers:

A century of turbulence theory - the main achievements and unsolved problems: **A. YAĞLOM** (Institute of Atmospheric Physics, Moscow, Russia/MIT)
Large-eddy simulations: **O. METAIS** (LEGI, Grenoble, France)
Scaling laws and scale invariance: **G. FALKOVICH** (Weizmann Institute, Israel)
Burgers turbulence in one and several dimensions: **U. FRISCH** (Cote d'Azur Observatory, Nice, France)
Industrial modelling of turbulence: **M. LESCHZNER** (Queen Mary College, London, U.K.)
Computational aeroustics: **R. MANKBADI** (University of Cairo, Egypt/NASA-Lewis, Cleveland, USA)
Helicity in neutral and MHD turbulence: **K. MOFFATT** (DAMTP, Cambridge, U.K.)
Two-dimensional turbulence: **J. SOMMERIA** (LEGI, Grenoble, France)
Wavelet techniques: **M. FARGE** (LMD, Paris, France)
Scaling laws from experiments: **K. SREENIVASAN** (Yale, USA)
Instability and vortices in rotating flows: **E. WEISFREID** (ESPCI, Paris, France)
Dislocations and phase turbulence: **P. COULLET** (INLN, Nice, France)

Scientific Context:

This Summer School has several objectives. The first one is to present the spectacular progresses made these last ten years in the domain of turbulence coherent-vortex self-organization, thanks in particular to new large-eddy simulation methods. We intend also to describe the modern tools developed for the analysis of fluid turbulence in three and two dimensions: normal and anomalous scaling laws, turbulent mixing and Lagrangian dynamics, maximum-entropy states, wavelet techniques, nonlinear amplitude equations. From a more practical viewpoint, one will study the influence on turbulence of boundaries, compressibility, curvature and rotation, helicity, magnetic fields. Finally, various applications of turbulence modelling and control to certain industrial or environmental situations will be considered. Specialized seminars by leading European specialists will also be given, on fundamental or more industrial topics related to the programme. It is intended mainly for PhD students and young researchers in fluid mechanics, condensed-matter physics, applied mathematics and environmental sciences. The participation of students from Eastern Europe is strongly encouraged. A computing centre connected to the international network will be also set up, for practical works on simulation, modelling or signal processing.

Scientific Committee: G. FALKOVICH, M. FARGE, M. LESIEUR, K. MOFFATT, A. YAĞLOM

Inscriptions:

Applications must be send to the School **before March 1, 2000**. A selection committee will select the participants. A financial contribution is requested from each participant (FF 4500 - € 686 - for Academic, FF 8000 - € 1220 - for Industrial). It covers accommodation and meals, which are provided within the School for both participants and lecturers. Possibilities of grants exist, in particular for students from Eastern Europe and developing countries. Application forms and additional information are available from:

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This session has received the financial support from the **NATO Advanced Study Institute (ASI) Program** and from the **European Commission High-Level Scientific Conferences (HLSC) Program**

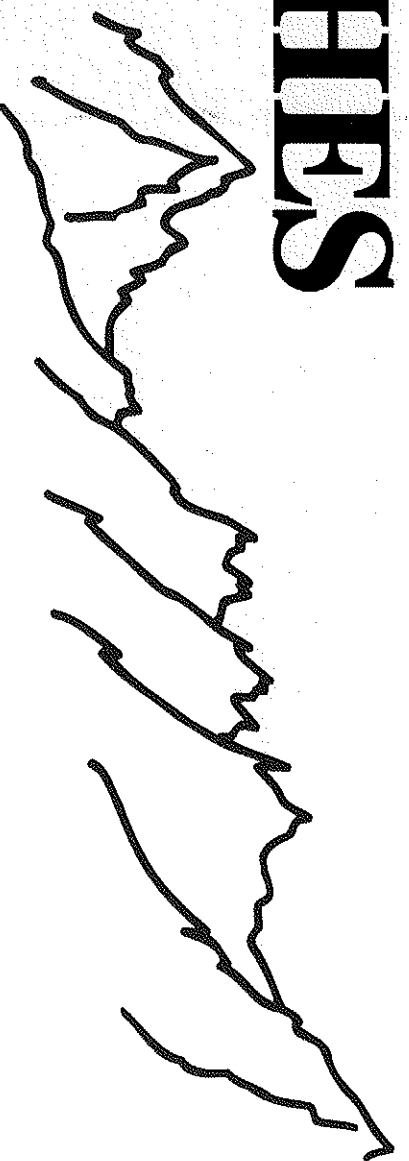
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Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches.

Director: François DAVID

LES HOUCHES

SESSION LXXV



1951 - 2001
50th anniversary

École d'été de physique théorique

NATO Advanced Study Institute - Danish Research Agency's
Graduate School of Biophysics - Euro Summer School

PHYSICS OF BIO-MOLECULES AND CELLS PHYSIQUE DES BIOMOLÉCULES ET DES CELLULES

July 2-27, 2001

Scientific Direction:

Henrik Flyvbjerg (Risø Nat'l Laboratory & Niels Bohr Inst., Copenhagen, Denmark)

Pál Ormos (Biological Research Center of the Hungarian Academy of Sciences, Szeged, Hungary)

Frank Jülicher (Institut Curie, Paris, France)

Lecture series:

Mechanics of Motor Proteins and the Cytoskeleton:

J. HOWARD (Max Planck Institute for Molecular Cell Biology and Genetics, Dresden, Germany)

Modelling Molecular Motors: T. DUKE (Cavendish Lab, Cambridge, UK)

Physics of Protein-DNA Interactions: R. BRUNSMMA (University of Leiden, The Netherlands)

Molecular Force Spectroscopy: E. EVANS (Boston University, USA, and University of British Columbia, Canada)

Cell Mechanics and Adhesion: E. SACKMANN (TU-Munich, Germany)

Biological Physics with Micro-fabricated Devices: R. H. AUSTIN (Princeton University, USA)

Gene Regulation: Dissection by probabilistic methods, comparative analysis, and DNA micro-array data:

E. SIGGIA (Rockefeller University, New York, USA)

Thinking About the Brain: W. BIALEK (NEC Research Institute, Princeton, USA)

Seminars and shorter lecture series:

S. BLOCK* (Stanford University, USA), A. BOULBITCH (TU-Munich, Germany), M. DOGTEROM (AMOLF, The Netherlands),

T. DUKE (Cavendish Lab, Cambridge, UK), S. LEIBLER (Princeton University, USA), A. LIBCHABER (Rockefeller Univ., USA),

J. PROST (Institut Curie, Paris, France), T. VICSEK* (Eötvös Univ., Budapest, Hungary), and others. (* to be confirmed)

Scientific Program: Physics plays an increasing role for the understanding of many phenomena in living systems. This summer school is intended for doctoral and postdoctoral researchers with a background in physics and an interest in biological systems. In-depth lecture series will cover recent examples of physical approaches to biological systems and include introductions to the relevant biology. Shorter lecture series and seminars will present latest developments and trends, e.g., gene regulation, genetic and biochemical networks, the physics of sensory systems, propulsion of *Listeria* and other biological motion, theoretical aspects of micro-fabricated devices. There will also be time for personal work, discussions and working groups.

Registrations: Applications must have reached the School **before March 1, 2001** in order to be considered by the selection committee. A financial contribution of 4500 FF - 686 € is requested from each participant (it covers housing and meals at the school). Grants will be available, in particular for students from Eastern Europe and developing countries. To get the application forms and additional information, contact the School at

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This session is supported by the NATO Advanced Study Institute program, by the Danish Research Agency's Graduate School of Biophysics and by the European High-Level Scientific Conferences program (HPCF-CT-2000-00122).

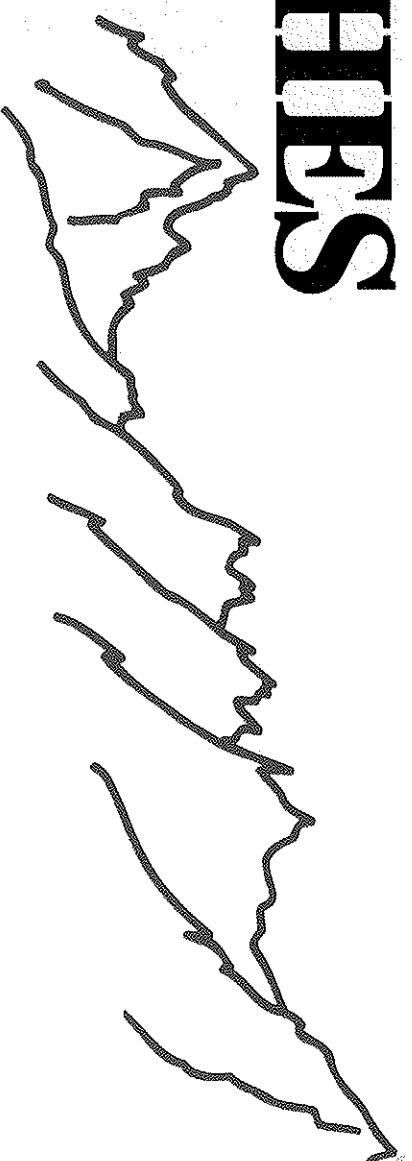
Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches

Director: François DAVID

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SESSION LXXVI

1951 - 2001
50th anniversary



École d'été de physique théorique

NATO Advanced Study Institute - Euro Summer School

UNITY FROM DUALITY: GRAVITY, GAUGE THEORY AND STRINGS

L'UNITÉ DE LA PHYSIQUE FONDAMENTALE: GRAVITÉ, THÉORIE DE JAUGE ET CORDES

July 30 - August 31, 2001

Scientific Direction:

Costas Bachas (Ecole Normale Supérieure, Paris, France)
Nikita Nekrasov (ITEP, Moscow, Russia & IHES, Bures sur Yvette, France)
Adel Bilal (Univ. of Neuchâtel, Switzerland)
Michael Douglas (Rutgers Univ. USA & IHES, Bures sur Yvette, France)

Main Lecture series:

Calabi-Yau Manifolds, Mirror Symmetry and Number Theory: **P. CANDELAS** (Oxford, UK)
Supergravities: **B. DE WIT** (Spinoza Institute, Utrecht, Holland)
Perturbative and non-perturbative String Theory: **M.B. GREEN** (DAMPT, Cambridge, UK)
Supergravity Description of N=1 Supersymmetric Gauge Theories: **I. KLEBANOV** (Princeton, USA)
Gauge Theory/Gravity: **J. MALDACENA** (Harvard, USA)
Supersymmetric Gauge Theories: **E. RABINOVICI** (Hebrew University, Jerusalem, Israel)
M theory and Dualities: **A. SEN** (Allahabad, India)
Non-commutative Field/String Theory: **A. STROMINGER** (Harvard, USA)

Shorter lecture series and seminars:

These will cover Black Holes, non-BPS branes, String Field Theory, Tachyon Condensation, D-branes in curved Geometries, Brane Worlds and Cosmology, String Phenomenology and other topics of current interest.

Scientific Program: In recent years our understanding of string theory - a candidate for the unification of all fundamental interactions including quantum gravity - has been radically modified. This summer school, intended for doctoral and young postdoctoral students, will provide an in-depth introduction to the subject leading up to the most recent developments. The main lectures will cover the modern perspective on string theories, M-theory, compactifications, black holes and the gauge theory/gravity correspondence. Shorter lectures and seminars will be devoted to more recent developments and subjects that are not covered in the main lectures. There will be time also for independent work, working groups and discussion sessions.

Registrations: Applications must have reached the School **before March 15, 2001** in order to be considered by the selection committee. A financial contribution of 5500 FF - 838 € is requested from each participant (it covers housing and meals at the school). Grants will be available, in particular for students from Eastern Europe and developing countries. To get the application forms and additional information, contact the School at

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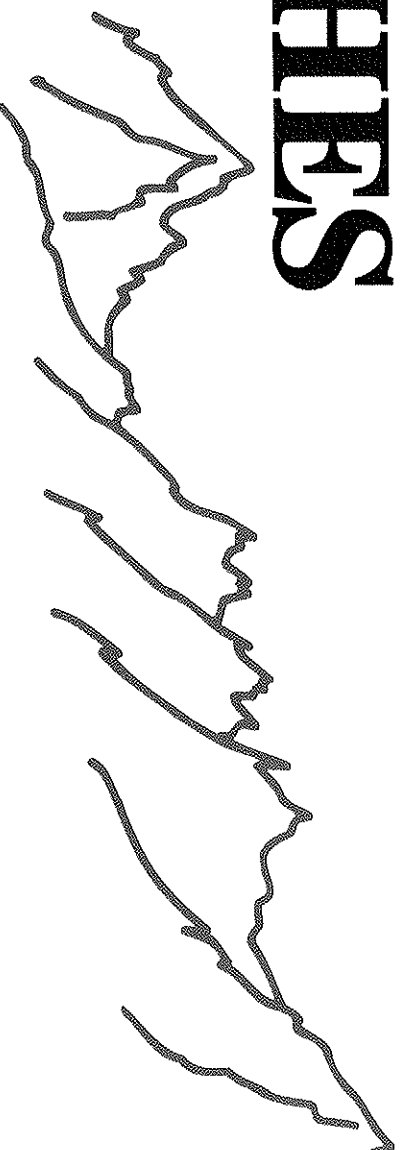
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This session is supported by the NATO Advanced Study Institute program, by the European High-Level Scientific Conferences program (HPCF-CT-2000-00121), and by the European Research Training Networks "Superstring Theory" (HPRN-CT-2000-00122) and "The Quantum Structure of Spacetime" (HPRN-CT-2000-00131).

Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches

Director: François DAVID

LES HOUCHES



SESSION LXXVII

École d'été de physique théorique

NATO Advanced Study Institute - Euro Summer School
SLOW RELAXATIONS AND NONEQUILIBRIUM DYNAMICS
IN CONDENSED MATTER
RELAXATIONS LENTES ET DYNAMIQUES HORS D'ÉQUILIBRE
EN PHYSIQUE DE LA MATIÈRE CONDENSÉE

July 1-26, 2002

Scientific Direction: Jean-Louis BARRAT (Université Claude Bernard, Lyon, France)
Mikhail FEIGELMAN (Landau Institute, Moscow, Russia)
Jorge KURCHAN (ESPCI, Paris, France)

Lecture series :

J.-P. Bouchaud (CEA Saclay): Granular matter: some ideas from statistical mechanics.
M.E. Cates (Edinburgh): Rheology and dynamics of soft condensed matter.
L. Cugliandolo (ENS Paris): Slow non-equilibrium dynamics: analytical methods.
D. Fisher (Harvard): Dynamics of randomly pinned objects.
G. Parisi (Roma): Introduction to replica theory for glassy systems.

Shorter Lectures and Seminars:

A. Ajdari (CNRS Paris): Aging and Rheology in pasty colloidal systems.
S. Bhattacharya (NEC Princeton): Dynamics of vortices in superconductors.
B. Cabane (ESPCI Paris): Industrial problems with colloidal suspensions.
S. Ciliberto (CNRS Lyon): Out of equilibrium systems: an experimentalist point of view.
A. Finkelstein (Moscow): Protein structures: thermodynamic and kinetic aspects.
W. Kob (Montpellier): Introduction to the physics of structural glasses: From experiments to computer simulations
Z. Racz (Budapest): Non-equilibrium phase transitions
D. Wales (Cambridge): Energy landscapes in complex systems.
Other seminars will be contributed by participants and short term visitors.

Scientific Program:

Many-particle systems having a collective evolution that is much slower than the microscopic motion are a common feature in condensed matter. Systems with such slow relaxations are very often out of equilibrium, since a laboratory experiment generally takes place on time scales shorter than their relaxation time. This makes them very challenging objects of study, as usual statistical mechanics tools are insufficient. In fact, many of the solids that surround us - and the systems we encounter in practical and industrial applications - belong to this category. One may cite, for example :

- Structural glasses, including plastics and colloids, and spin glasses.
- Powders and granular matter undergoing compaction or slow flow.
- Type II superconductors carrying a current.
- Defects in crystals. Ripening of surfaces. Domain growth. Wetting.
- Foams, emulsions and colloids.

The focus of the school will be on the unifying concepts that can lead to a common view of this wide class of systems, based on ideas developed during the late eighties and nineties in the fields of glasses and spin glasses, of complex fluids, and for the study of randomly pinned systems.

Registrations: Applications must have reached the School before **March 4, 2002** in order to be considered by the selection committee. A financial contribution of **762 € (5000 FF)** is requested from each participant (it covers housing and meals at the school). Grants will be available, in particular for students from Eastern Europe and developing countries. To get the application forms and additional information, contact the School at

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La Côte des Chavants Email : secretariat.houches@ujf-grenoble.fr
74310 LES HOUCHES, France Web: <http://www-houches.ujf-grenoble.fr/>

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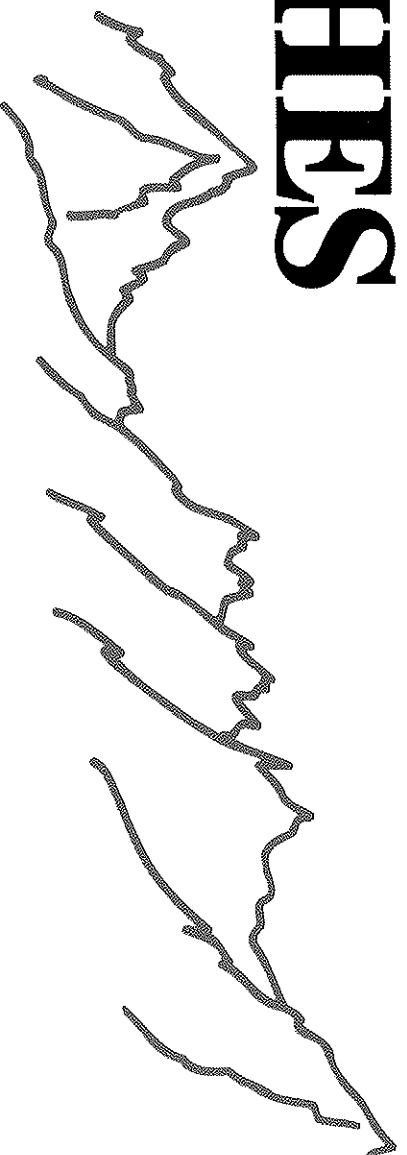
Director: François David->Jean Dalibard

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This session is supported by the NATO Advanced Study Institute program (ASI 978104) and by the European High-Level Scientific Conferences program (HPCF-CT-2001-00075).

LES HOUCHES

SESSION LXXVIII



École d'été de physique théorique

NATO Advanced Study Institute - Euro Summer School

ACCRETION DISCS, JETS AND HIGH ENERGY PHENOMENA IN ASTROPHYSICS

DISQUES D'ACCRETION, JETS ET PHÉNOMÈNES DE HAUTE ÉNERGIE EN ASTROPHYSIQUE

July 29 - August 23, 2002

Scientific Direction:

Guy PELLETIER (Observatoire de Grenoble, France)
Gilles HENRI (Observatoire de Grenoble, France)
François MENARD (Observatoire de Grenoble, France)
Vassily BESKIN (Lebedev Institute, Moscow, Russia)

Lecture series:

M. Camenzind (Heidelberg, Germany): Physics of black holes environment.
W. Benz (Bern, Switzerland): Hydrodynamics and accretion discs.
J. Heyvaerts (Strasbourg, France): Magnetohydrodynamics.

Shorter Lectures and Seminars:

R. Pudritz (Hamilton, Canada): Accretion-Ejection models.
B. Achterberg (Utrecht, Netherlands): Particle acceleration theory and high energy cosmic rays.
N. Calvet (Merida, Venezuela): Accretion diagnostics in Young Stellar Objects.
B. Czerny (Warsaw, Poland): Accretion around Active Galactic Nuclei.
E. Waxman (Rehovot, Israel): Gamma-ray bursts.
V. Berezhinsky (Moscow, Russia): Top-down models of UHE cosmic rays.
R. Sunyaev (TBC) (Garching, Germany): Galactic compact objects.
L. Hartmann (Cambridge, USA): Evolution of accretion discs.
T. Montmerle (Saclay, France): X-ray emission of Young Stellar Objects.

Short seminars presenting the new generation instruments and telescopes and training sessions will be also organised.

Scientific Program: The accretion process is thought to play a key role in the Universe. It leads to the formation of new stars; it releases enormous amounts of energy when taking place onto compact objects. It is also believed that gamma-ray bursts are due to the sudden release of energy through a rapid accretion process accompanying the formation of a black hole, either by coalescence of compact objects or the final explosion of a very massive star. These events could explain the highest energy cosmic rays, whose origin is still controversial. The observations have shown that accretion processes are associated with the ubiquitous presence of jets, either in young stellar objects, active galactic nuclei or in X-ray binaries. Magnetohydrodynamics seems to play a key role in jet formation. The school will present the most recent theoretical works on these topics, starting from basic theory to advanced applications, as well as current observational facts. It will also include observational training sessions to help the students and young researchers to practice the most up-to date observing techniques (high energy observations, high angular resolution techniques...).

Registrations: Applications must have reached the School before **March 4, 2002** in order to be considered by the selection committee. A financial contribution of **762 € (5000 FF)** is requested from each participant (it covers housing and meals at the school). Grants will be available, in particular for students from Eastern Europe and developing countries. To get the application forms and additional information, contact the School at

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La Côte des Chavants
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Les Houches is a resort village in the Chamonix valley in the French Alps. Established in 1951, the Physics School is located in a group of chalets surrounded by meadows and woods, at an altitude of 1150 m facing the Mont-Blanc range - a very favourable environment for intellectual activity in ideal surroundings for hiking, mountaineering and sight-seeing.

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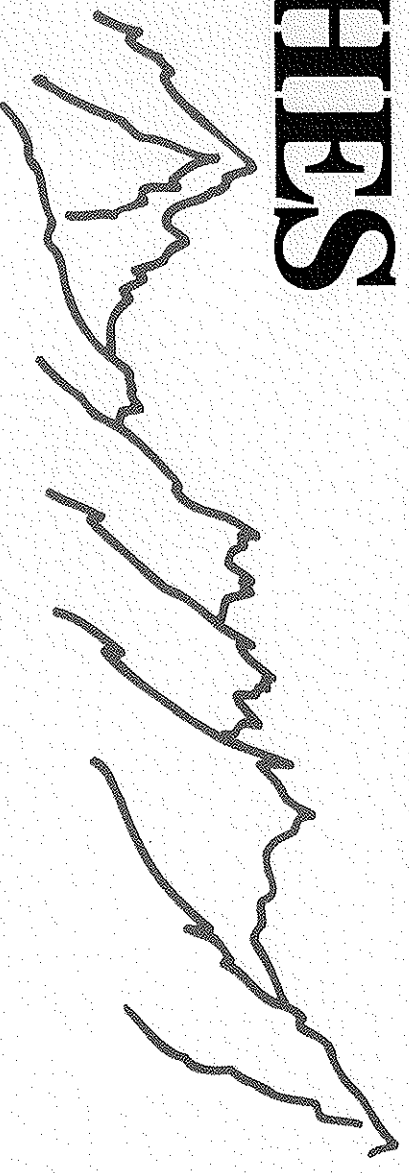
This session is supported by the NATO Advanced Study Institute (ASI 978132) program and by the European High-Level Scientific Conferences (HPCF-CT-2001-00018)

Ecole de Physique des Houches, Côte des Chavants, F-74310 Les Houches

Director: François David->Jean Dalibard

LES HOUCHEs

SESSION LXXIX



École d'été de physique théorique

Euro Summer School

QUANTUM ENTANGLEMENT AND INFORMATION PROCESSING INTRICATION ET TRAITEMENT D'INFORMATION QUANTIQUES

June 30- July 25, 2003

Scientific Direction:

Daniel ESTEVE (Quantronics group, SPEC, CEA-Saclay, France)

Jean-Michel RAIMOND (Laboratoire Kastler Brossel, ENS, Paris, France)

Lecture series:

R. Blatt (U. Innsbruck) and D. Wineland (NIST, Boulder): Quantum information processing in ion traps.

I. Chuang (MIT, Cambridge): Principles of quantum computing.

M. Devoret (Yale U.) and C. Glatil (CEA and ENS, Paris): Introduction to quantum electronic circuits.

S. Haroche (Collège de France and ENS, Paris): Introduction to quantum optics and decoherence.

J. Jones (Oxford U.): Quantum information and Nuclear Magnetic Resonance

Shorter Lectures and Seminars:

M. Brune (ENS, Paris): Cavity quantum electrodynamics.

N. Gisin (U. Genève): Quantum cryptography

P. Grangier (IOTA, Orsay): Quantum cryptography: from single photons to many photons.

J. Martinis (NIST, Boulder): Phase superconducting quantum bit circuits.

H. Mooij (T.U. Delft): Flux superconducting quantum bit circuits.

D. Vion (SPEC, CEA-Saclay): Charge superconducting quantum bit circuits.

A. Wernsdorfer (CRTBT, Grenoble): Quantum nanomagnets.

A. Zeilinger (U. Vienna): Entangled photons and quantum communication.

P. Zoller (U. Innsbruck): Quantum communication and quantum computing with cold atoms and photons.

Other seminars will be contributed by participants and short term visitors.

Scientific Program:

The recent discovery that the laws of quantum physics could be used for efficient information processing or transmission led to a considerable upsurge of interest in developing a deeper understanding of quantum mechanics, and in fabricating genuine quantum processors. This new field gathers around common objectives various communities, such as theoretical physics, quantum optics or solid state physics.

On the theoretical side, the major advances concern quantum algorithms and quantum error correction codes. On the experimental side, significant advances have been realized in quantum optics, solid state physics and nuclear magnetic resonance. In particular, quantum logic gates have been demonstrated, and small-size quantum algorithms have been operated.

This school aims to provide a comprehensive overview of the theoretical and experimental aspects of quantum entanglement and information processing. It is opened to young researchers interested in learning the essentials of this new field. Introductory lectures will provide them with a common background, while more specialized lectures and seminars will give an up to date panorama.

Registrations: Applications must be reached the School before **March 7, 2003** in order to be considered by the selection committee. The full cost per participant, including housing, meals and the lectures book, is 1400. Thanks to financial support by various funding agencies, a contribution of only **750 / participant** is requested. A few additional grants will be available. To get the application forms and additional information, contact the School at

ÉCOLE D'ÉTÉ DE PHYSIQUE THÉORIQUE

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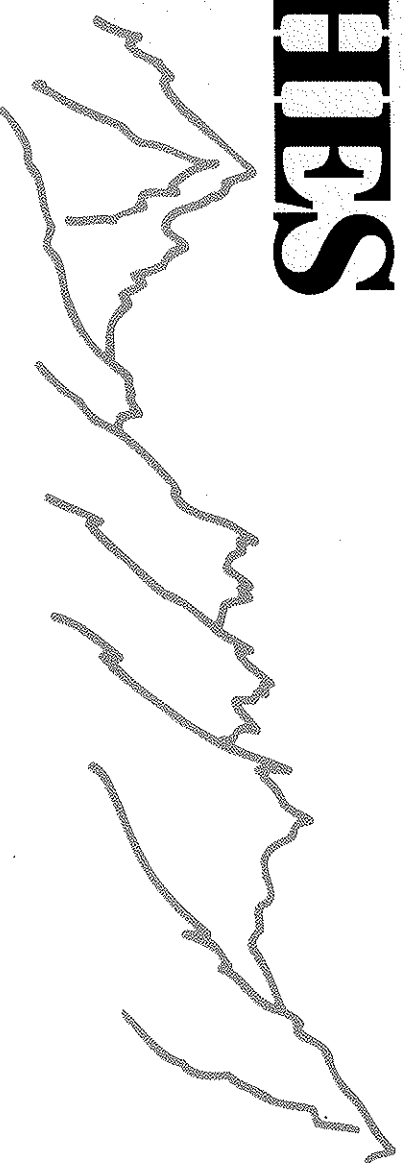
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Supported by the European High-Level Scientific Conferences program (HPCF-2002-00041) and the QUIPROCONE Network (IST-1999-29064)

LES HOUCHES

SESSION LXXX



École d'été de physique théorique

NATO Advanced Study Institute

METHODS AND MODELS IN NEUROPHYSICS

MÉTHODES ET MODÈLES EN NEUROPHYSIQUE

July 28 - August 29, 2003

Scientific Direction:

- C. C. Chow (Pittsburgh, USA)
- B. Gutkin (London, UK)
- D. Hansel (Paris, France)
- C. Meunier (Paris, France)
- I. Segev (Jerusalem, Israel)

Opening lecture:

- E. Marder (Waltham, USA): Why would a self-respecting experimental biologist be susceptible to theory?

Lecture series:

- L. Abbott (Waltham, USA): Synaptic plasticity and learning.
- P. Bressloff (Salt Lake City, USA): Pattern formation and visual cortex.
- E. Brown (Boston, USA): Statistical analysis of data.
- J. Rinzel (New York, USA): Non-linear dynamics of neurons.
- H. Sompolinsky (Jerusalem, Israel): Theory of large networks: from spikes to behavior.
- D. Terman (Colombus, USA): Singular perturbations analysis of neuronal dynamics.
- T. Tishby (Jerusalem, Israel): Biological information processing - an information theoretic perspective

Shorter Lectures and Seminars:

- N. Brunel (Paris, France): Stochastic dynamics of neurons.
- W. Gerstner (Lausanne, Switzerland): Models of synaptic plasticity.
- D. Golomb (Beersheva, Israel): Propagating activity in cortical circuits.
- G. Mato (Bariloche, Argentina): Theory of neural synchrony.
- C. Pouzat (Paris, France): Techniques for spike sorting.
- M. Shelley (New York, USA): Large scale models of primary visual cortex.
- A. Treves (Trieste, Italy): Information-theoretic approach to the evolution of the mammalian cortex
- M. Tsodyks (Rehovot, Israel): Synaptic dynamics.
- C. van Vreeswijk (Paris, France): Balancing excitation and inhibition in large networks.
- F. Wolf (Göttingen, Germany): A theory of cortical maps.

These lectures will be complemented by short topical workshops dedicated to specific neurophysiological issues and experimental aspects.

Scientific Program:

Many concepts and methods borrowed from Theoretical Physics, Dynamical Systems Theory, Signal Processing and Information Theory have been introduced, elaborated and used over the past years to study the nervous system. This school will focus largely on analytical approaches with a strong emphasis on the underlying physical concepts and on the mathematical techniques. It will provide the participants with the appropriate background for research in Neurophysics. In parallel, through the talks given by experimentalists during the workshops, the participants will become acquainted with some of the open issues in Neuroscience, particularly those in the somatosensory and the motor systems. This summer school is aimed at young researchers and established scientists with a background in Physics or Mathematics.

Registrations: Applications must be received by the School before **March 7, 2003** in order to be considered by the selection committee. The full cost per participant, including housing, meals and the lectures book, is 1500 €. Thanks to financial support by various funding agencies, a contribution of only **900 € /participant** is requested. A few additional grants are available. Application forms and additional information are available from the School at

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