

An Overwhelming Response

The 1462 technical papers submitted for presentation at this year's joint CLEO/Europe-EQEC conference (RAI Congress Centre, Amsterdam; 28 August - 2 Sept. 1994) promise a comprehensive overview of major developments in many topics. The EQEC part of this back-to-back event that mirrors the North American CLEO/International Quantum Electronics Conference is organized by the EPS Quantum Electronics and Optics Division. It received 641 submissions, so this first meeting bringing together the entire community of scientists and engineers working in lasers, electro-optics, quantum electronics, and related fields should be a great success. The Division's programme sub-committee chairs summarize the highlights.

Laser Spectroscopy

Some 20% of the EQEC submissions cover laser spectroscopy as it is a loose framework at the heart of laser applications. Highlights will be precision spectroscopic measurements (M. Inguscio *et al.*, Florence; W. Hogervorst *et al.*, Amsterdam) bringing us closer to an improved comparison of theory and experiment. The same precision is used by E. Hinds *et al.* (New Haven) to probe subtle phenomena such as Casimir effects (radiative corrections in a confined space). Optical lattices of laser-cooled atoms remain prominent (650 nK has been achieved by a group from Gaithersburg), but the laser cooling and coherence of simple atoms (hydrogen and helium) is brought to the fore (J.T.M. Walraven, Amsterdam; C. Cohen-Tannoudji *et al.*, Paris) since new techniques for cooling to lower temperatures are sought. While measurements with atom interferometers have proved more elusive, groups from MIT (C.R. Ekstrom *et al.*) and the University of Constance (T. Pfau) will report that progress is being made. Spectroscopy of a single atom or molecule embedded in a substance offers many opportunities, hence the interest in detecting the electron-spin resonance of Cs atoms implanted in solid He (T.W. Hänsch *et al.*, Munich). Last but by no means least, J.P. Woerdman & M. Kristensen (Leiden) will discuss whether the environment of Rb atoms in Xe behaves as a large quasimolecule whose effect on polarized light can be controlled with a magnetic field (the Faraday effect). The laser cooling of ions is represented by a report of quantum jumps of a single In ion stored in a trap (H. Walther *et al.*, Garching).

Nonlinear Optical Phenomena

Judging from the submissions to the sessions on nonlinear optical phenomena, the field now resembles nonlinear science in general, with interests not simply in frequency conversion but also in nonlinear dynamics and wave phenomena. This perhaps explains why the area dominates the joint conference with over 200 submissions. Spontaneous optical patterns feature strongly, with a good balance between theory and experiment. Highlights are optical patterns in a liquid crystal cell with one feedback mirror (M. Tamburrini *et al.*, Rome) and a review by G.-L. Oppo (Stratclyde). Nonlinear dynamics in optical systems includes chaos in systems with different degrees of freedom using a T-shaped cavity (E. Göbel *et al.*, Marburg). Chaos in fibres, another topical area, includes work on synchronously driven fibre resonators (F. Mitschke *et al.*, Hannover) and chaos control in fibre lasers (P. Glorieux, Lille) that points to the CLEO-

CLEO/Europe-EQEC is sponsored by the European Physical Society, IEEE/Lasers and Electro-Optics Society, and the Optical Society of America in co-operation with the European Optical Society, The Institute of Physics (UK) and The Institution of Electrical Engineers. For information, contact: Meetings & Conferences Dept., IoP, 47 Belgrave Sq., London SW1 8QX, UK. Tel.: +45-71-235 61 11 — Fax: +44-71-259 60 02

Europe sessions on the applications of chaos. Stable, nonlinear states have a longer history, and more obvious applications; EQEC will cover the well-established main themes (optical bistability, nonlinear propagation, solitons). Classical nonlinear optics is highlighted by talks on quasi-phase matching

for frequency conversion, second-order processes, four-wave mixing, and special materials, notably chiral media which yield stereochemical information about biomolecules (N.I. Koroteev *et al.*, Moscow) and measurements on glasses with semiconductor crystal-lites (G.P. Banfi *et al.*, Pavia) questioning the validity of theories claiming that electron confinement affects nonlinearity.

Quantum Optics

The central themes of the quantum optics sessions are connected with the manipulation and transformation of states of atoms and light through nonlinear interactions. Cavity quantum electro-dynamics in which atom-field interactions are enhanced through confining the atomic sources in high-impedance cavities will be highlighted in invited talks (J.M. Raimond, Paris; H. Walther, Garching) while A.S. Parkins (Constance), P. Zoller (Colorado), H.J. Kimble (Pasadena) *et al.* will describe how quantum states can be "engineered" by adiabatically transferring atomic coherence to quantum fields. Reducing quantum noise to below the standard quantum limit continues to be of interest, especially now that quantum non-demolition has shown potential for information processing. Recent work on monitoring single quantum trajectories conditioned by the history of

Imperial College of Science, Technology and Medicine

POST-DOCTORAL POSITION IN THEORETICAL CONDENSED MATTER PHYSICS

Applications are invited for a post-doctoral position on quantum Monte Carlo methods in solids. The appointment is expected to start on or after 1st October 1994 and will run for one year initially, with extension to a second year likely. Starting salary from £14,962 to £18,726 per annum depending on age and qualifications.

The position is associated with a European Community Human Capital and Mobility Programme Research Network comprising the groups of Franco Meloni in Cagliari, Richard Needs in Cambridge, Stephen Fahy in Cork, José-Luis Martins in Lisbon, Matthew Foulkes in London, Xavier Gonze in Louvain, and Giovanni Bachelet in Rome. The successful applicant will be based in London and must be a citizen of an EC country other than the UK. There will be ample opportunity to make extended visits to some of the other institutions in the network.

Applications and further information from Dr. W.M.C. Foulkes, Dept. of Physics, Imperial College, London SW7 2BZ. Tel.: +44 (71) 225 88 05; email: m.foulkes@ic.ac.uk.



POSTDOCTORAL POSITION

in Experimental Intermediate-Energy Physics

A postdoctoral position is available at the Institute of Particle Physics of the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland.

Candidates should have some research experience in particle or nuclear physics (PhD). They are expected to take an active part in the preparation and realization of experiments. The duration of the contract is two or three years with a possible extension.

The experiments will be done mainly at the Paul Scherrer Institute in Villigen, Switzerland. We use a recently developed powerful source of polarized β -emitters or the high intensity muon beams to investigate some fundamental symmetries of the weak interaction (time reversal violation, right handed currents, limits to scalar and pseudo-scalar couplings).

Candidates should send a *curriculum vitae* and arrange for two letters of reference to be sent to:

ETH Zürich
Personalabteilung
Herrn K. Zurbuchen
ETH-Zentrum
CH - 8092 Zürich, Switzerland

For additional information, please contact: lang@imp.phys.ethz.ch

past observations will be reviewed by the pioneers (H.J. Carmichael, Eugene; K. Mølmer, Aarhus) as it is proving to be invaluable in modelling laser cooling. P. Mandel (Brussels) will summarise achievements in exploiting coherent effects (e.g., interference of atomic states induced by intense classical fields) to suppress losses while preserving laser gain. Finally, phenomena at the single quantum level form the basis of secure optical communication. In testing quantum behaviour over long distances, P.R. Tapster *et al.* (Malvern) will report that two-photon interference can be observed in fibre interferometers separated by up to 4.3 km of fibre.

Optical Interactions with Matter

A session on ultrafast dynamics in semiconductors will cover coherent spontaneous radiation of ballistic electrons in superlattices (hot-electron luminescence) that can be employed to characterise these types of structures (Yu.A. Malov & D.F. Zaretsky, Moscow), as well as spin-splitting of quantum wells in magnetic fields using time-resolved spectroscopy to overcome inhomogeneous broadening due to well-depth fluctuations (I. Bar-Joseph, Rehovot). Other topics are resonant optical instabilities in evaporation induced by laser radiation (N.E. Kask & S.V. Michurin, Moscow) and the inverse Faraday effect. J.-Y. Marzin (Paris) will show how the high-resolution spectroscopy of self-organized quantum dots giving small recombination linewidths opens up new opportunities. Non-linear spectroscopy can probe spatial correlation in polymers (J. Knoester *et al.*, Groningen) and time-resolved spectroscopy is invaluable for studying X-ray microplasma sources (D. von der Linde, Essen) and the technically very important shallow donors in GaAs (T.O. Klaassen *et al.*, Delft). The ma-



nipulation of light fields will feature work on trapping with phase holograms, wavefront dislocations from optical damage in photonic crystals, and the simulation (U. Janicke & M. Wilkens, Constance) of near-field atom optics which may have important applications in atom lithography.

Physics of Coherent Light Sources

Novel designs for laser cavities continue to be developed, while carrier dynamics in quantum-well semiconductor lasers is now known to involve both classical transport and quantum mechanical capture (G. Eisenstein, Haifa; M. Priesel, Copenhagen). G. Huber (Hamburg) will review new sources for tuneable solid-state lasers in the near-infrared, and even in the visible with direct, internal upconversion. New dopants allow emission from fibre lasers in the near-infrared, and new excitation schemes being proposed are based on coherent coupling of atomic levels, and on relativistic effects of ionization in strong laser fields.

Ultrafast Phenomena

Several sessions provide a glimpse of the changes taking place in the rapidly growing field of ultrafast phenomena, where the physics and applications of femtosecond technology are displacing technical develop-

ments. Among the many topics covered are laser-generated X-ray plasma sources with reports on the feasibility of high-brightness soft X-ray sources, and on spectra from alumina targets struck with state-of-the-art 100 mJ pulses of 260 fs duration (C. Sauteret *et al.*, Limeil). Ultrafast phenomena associated with quantum wells, exciton dynamics and superlattices provide much interest, especially in fundamental studies of electron wave packets in atoms (H.B. van den Heuvel, Amsterdam); polarization selection rules for quantum beating; bi-excitons and exciton bleaching in GaAs quantum wells; excitons and carriers in multiple quantum wells (R.H.M. Groeneweld *et al.*, Nijmegen); and lattice vibrations and Bloch oscillations with the emphasis on THz radiation emission (H. Kurz, Aachen) for semiconductor dipole antenna. Invited talks will highlight interactions in plasma (R. Falcone, Berkeley), solvent dynamics in solutions (D.A. Wiersma, Groningen), coherent solid-state phenomena (De Korsy, Aachen), hole relaxation in semiconductors (T. Elsaesser, Berlin), and high-sensitivity phase spectroscopy to measure, for instance, the spin structure of Sm atoms in a beam (J.-C. Diels, Albuquerque).

Lasers in Chemistry and Biology

The applications of lasers in biology and chemistry are obviously widespread. From a more fundamental viewpoint, today's possibilities are beautifully demonstrated by work on small-molecule dynamics, notably wave packets in light-harvesting pigments using femtosecond spectroscopy (T. Pullerits *et al.*, Umea & Sheffield), high-resolution quantum beat spectroscopy (J.R. Huber, Zurich) and the measurement of molecular properties by relating the behaviour of a single molecule to its environment (R. Rigler, Stockholm).

ESSENTIAL READING

...from Wiley



WILEY
Publishers Since 1807

Theory of Solitons in Inhomogeneous Media

F.K. ABDULLAEV, Uzbek Academy of Sciences, Uzbekistan

This book is devoted to a systematic exposition of the properties of solitons in inhomogeneous media. Topics treated include the production of slowly-varying solitons and their interaction, and the generation of new structures. The Theory of Solitons in Inhomogeneous Media, is the first to deal with in detail, inhomogeneity of the medium and other effects which preclude complete integrability.

CONTENTS:

- Principles of Soliton Theory Dynamics of Solitons in Random Fields and Media
- Adiabatic Dynamics of Solitons
- Radiative Effects in Inhomogeneous Media
- Dynamics of Solitons in Random Fields and Media
- Dynamical Chaos of Solitons and Breathers in Inhomogeneous Media

Series: Wiley Series in Nonlinear Science
0471942395 182pp 1994 £45.00/\$72.00

Introduction to Perturbation Techniques

A.H. NAYFEH, Virginia Polytechnic Institute and State University, USA and Yarmouk University, Jordan

- Similarities, differences, advantages, and limitations of perturbation techniques are pointed out concisely
- The techniques are described by means of examples that consist

mainly of algebraic and ordinary differential equations

- Each chapter contains a number of exercises

Contents: Introduction; Algebraic Equations; Integrals; The Duffing Equation; The Linear Damped Oscillator; Self-Excited Oscillators; Systems with Quadratic and Cubic Nonlinearities; General Weakly Nonlinear Systems; Forced Oscillations of the Duffing Equation; Multifrequency Excitations; The Mathieu Equation; Boundary-Layer Problems; Linear Equations with Variable Coefficients; Differential Equations with a Large Parameter; Solvability Conditions; Appendices; Bibliography; Index

Series: Wiley Classics Series
0471310131 536pp 1993 paper
£36.95/\$49.95

Intermediate Classical Mechanics with Applications to Particle Acceleration

L. MICHELOTTI, FERMI LAB, USA

An introduction to modern dynamics, both linear and nonlinear, (from a mathematical point of view), this book emphasizes qualitative concepts, while including modern computational techniques. The applications covered in this book focus on areas of interest to beam physicists, particle accelerator physicists, and engineers working in these fields. Because of its introductory nature and brevity, the book should also be of interest to a broad range of physicists.

An excellent introductory textbook on

dynamics, this book presents a solid, systematic development of dynamics. It will also cover Hamiltonian dynamics, perturbation theory, and chaos.

Series: Particle Accelerator Physics Series
0471553840 approx 350pp due 1994 approx
£45.50/\$63.50

Pulsed Laser Deposition of Thin Films

D.B. CHRISSEY and G.K. HUBLER, both of Naval Research Laboratory, USA

A comprehensive overview of what is required to set-up and begin research in this newly developing technology, allowing the reader to understand the basics of the process. Internationally recognized experts in their fields cover such fundamentals as history, theory, film characteristics, surface modification, laser technology, materials and applications. It also includes excellent reviews regarding the entire areas of semiconductor buffer layers, thin-film ferroelectrics and ferrites along with the work involving films deposited by PLD.

0471592188 approx 550pp due 1994
approx £61.95/\$86.50

Order from your Bookseller - or directly from Wiley. Cheques made payable to John Wiley & Sons Ltd., marked for the attention of Emma Levine. For credit card orders phone +44 (0)243 770237 or fax +44 (0)243 531712. All prices are correct at time of going to press. Please add £2.00/\$5.00 to cover postage. Save money - order more than one book and postage is FREE!

John Wiley & Sons Ltd
Baffins Lane Chichester West Sussex
PO19 1UD UK