Excited States and Multiresonant Optical Non-linearities in Solids

A conference on the above subject organized by the EPS **Quantum Electronics Division** and co-sponsored by the French CNRS was held at the Le Centre Paul Langevin in Aussois (France) on 18-20 March. Support also came from the French Physical Society, the DRET and the Centre National d'Etudes des Télécommunications which provided a substantial material help. The Conference attracted a lot of attention and about 100 participants from 10 countries continued until late in the night the very lively sessions at which 38 papers were presented, 15 of which were invited.

When solids are excited by laser light in such configurations that all the transitions involved are at resonance or close to it, they exhibit huge optical non-linearities. These features give rise to fundamental problems and may open numerous possible applications in the treatment of coherent optical radiation such as: control of one laser by another, optical logics, correction of optical aberration or real time holography. These very high non-linearities are observed at the edge of the transparency range of semiconductors (GaAs, InSb). Their origins are not fully understood, as antagonistic processes interfere with relative contributions, depending on the exciting intensities. They give rise to non-linear refraction and absorption which have been used to produce optical bistability that is exploited in optical switches (transphasers) with very small switching energies (picojoules).

Optical non-linearities associated with the quasi three levels system: ground state-exciton-excitonic molecule in multiresonant configurations, are so large that the usual perturbation approach is no longer suitable for describing the light-matter interaction. One has to "renormalize" the optical constants of the crystal, to account for higher order multiphoton processes. In fact, interactions involving up to 12 photons were reported at the Conference, and were shown to arise mostly from cascade processes, with however a small direct contribution. These non-linearities can be used for very quick optical logics with switching times in the picosecond range.

Under such an intense excitation, the phase and energy relaxation are of capital importance, and relevant investigation on excited state dynamics of semiconductors was presented. It was shown that multiresonant non-linearities can also help to reveal some features of elementary excitation interactions. For processes in the picosecond range, they can be read directly in the time domain (reliable operation of a tunable dye laser delivering 0.09 ps pulses was reported in one talk); for shorter processes, investigations in the frequency domain through 4-wave quasi-degenerate mixing are more suitable.

Finally let us mention that the beautiful landscape of Le Massif de la Maurienne, surrounding the Conference location as well as the delightful hospitality of the Centre Paul Langevin staff greatly contributed to the relaxed atmosphere and the lively discussions which made the Conference so successful.

D.S. Chemla, CNET

HEPP

A ballot of members of the **High Energy and Particle Physics Division** was held to fill five vacancies on the Board of the Division: 183 members voted. The following were elected to serve for a period of six years from July 1981:

G. Bellini, University, Milan
H. Bøggild, Niels Bohr Institute, Copenhagen
E. Lillestøl, University, Bergen
A. Martin, CERN, Geneva
R. Salmeron, Ecole Polytechnique, Palaiseau

The Chairman and Secretary will be elected when the new Board meets at the Lisbon Conference.

Call for Nominations

The EPS Selection Committee for the **Hewlett-Packard Europhysics Prize,** awarded for outstanding achievement in the field of solid state physics, will welcome nominations made by members of EPS for the 1982 award.

The award is made in recognition of a recent work in the area of physics of condensed matter, specifically work leading to advances in the fields of electronic, electrical and materials engineering which, in the opinion of the Society's Selection Committee, represents scientific excellence.

Deadline for receiving proposals is 15 Aug. 1981. Note that no award will be made for 1981 because not enough proposals were submitted in time.

With any proposal, the Committee needs: a clear definition of the work in question, a short biography of the candidate, and a list of relevant publications and reprints describing the work (undertaken within the past five years) for which the award would be made.

All information should be sent in confidence to the EPS Secretariat.

OFFICIAL ANNOUNCEMENT

At the next meeting of the EPS Council, which will be held at the Bogaziçi University of Istanbul, on Sunday, 6 September 1981, delegates will be invited to vote on the following proposition that has been formulated by the Executive Committee of EPS.

"In accordance with the provisions of Rules 34 and 35 of the By-Laws, the Council agrees that the Unit Fee shall be raised from Swiss Francs, 8.— to Swiss Francs 9.— with effect from 1 January 1982."

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  Chemical Physics
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  Molecular Physics
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  Magnetism
  Metals
  Semiconductors and Insulators
  Surface and Interface
High Energy & Particle Physics Division
Nuclear Physics Division
Plasma Physics Division
Quantum Electronics Division

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