# 1990 Hewlett-Packard Europhysics Prize

The Hewlett-Packard Europhysics Prize for 1990 for outstanding achievements in solid state physics has been awarded jointly to Dr. Roberto Car and Dr. Michele Parrinello of the International School for Advanced Studies, Trieste for "the development of a novel and powerful method for the *ab initio* calculation of molecular dynamics".

As described in their recent article in *Europhysics News* **20** (1988) 69, the Car-Parrinello method efficiently combines the advantages of molecular dynamics sampling with the accuracy of the local-density-functional approach to yield remarkably accurate simulations of many scientifically and technologically important phenomena.

The award will be presented at the 8th General Conference of the EPS to be held in Amsterdam on 4-8 September 1990.

# Ion Beams in Materials Research and Technology

4th Europhysics Industrial Workshop (EIW-4)

The latest in the series of industrial workshops initiated by the EPS Action Committees for Applied Physics and Physics in Industry was held in the Physikzentrum of the German Physical Society in Bad Honnef on 10-13th October 1989. Some 40 people took part in the very informative and stimulating meeting that was jointly sponsored by the EPS and Forschungszentrum (formerly Kernforschungsanlage - KFA) Jülich. The programme was divided into five sessions, as follows:

Particle Beam Analysis
K. Bethge, Frankfurt

Ion Beam Assisted Deposition and Surface Modification of Metals
H. Dimigen, Hamburg

New Trends in Ion Implantation
E. Rimini, Catania

Ion Beam Synthesis and Ion Beam Mixing
C.L. Jaussaud, Grenoble

Ion-Solid Interaction
R. Kassing, Kassel

Each session consisted of invited talks and short contributions, and often developed into a lively and interesting discussion. The success of the workshop was ensured by having an informal programme run by a few specialists who, together with the participants, were able to concentrate for three days on a particular subject in the friendly atmosphere of the Physikzentrum.

Ion beam technology is well-established in the semiconductor industry for the controlled introduction of impurities in semiconductor wafers. Indeed the present status of VLSI semiconductor technology is unthinkable without it. This does not mean that ion implantation is without new and exciting developments with other promising areas of application. The workshop was particularly interesting because it focussed on these developments.

The surface modification of materials such as metals, ceramics and plastics by ion beams to improve various properties (*e.g.* friction, wear, corrosion resistance *etc.*) is becoming more and more important. A number of practical applications in this area have already emerged, but much has yet to be learned so as to be able to understand the physical and chemical processes taking place during and after implantation.

The high doses (above $10^{16}$ $cm^{-2}$) over large surface areas required for conventional ion implantation demand machines with high current beams. However, even larger currents are needed for ion beam synthesis where doses are often above $10^{18}$ $cm^{-2}$. Closest to application is probably SIMOX (separation by implantation of oxygen) technology in which a crystalline silicon-on-insulator structure results from the formation of a buried silicon-oxide layer upon oxygen implantation at elevated substrate temperatures. Good results have been obtained and it now remains to be seen if the advantages of making large CMOS structures in monocrystalline silicon layers on a buried oxide outweigh the increase in costs of the starting material. Other ion beam synthesis programmes are still in a much more exploratory phase, an interesting one being the formation of buried crystalline $CoSi_2$ layers in silicon with alignment of the lattice with the substrate crystal.

Another clear tendency is the increasing importance of high energy implantation at about 1 MeV and above, for which more and more establishments are acquiring the necessary equipment. High energy implantation is already being used to achieve more flexible control of doping profiles in Si-technology than can be obtained by low energy implantation followed by a diffusion step (*e.g.* retrograde wells in CMOS technology). Most of the other work in this area is still in the research phase, such as damage creation by high energy beams where one interesting phenomenon that has been observed is the solid state epitaxial regrowth of amorphised layers stimulated by a flux of energetic ions.

The extension of dose levels and implantation energies to higher values is leading on the one hand to the synthesis of novel materials, and on the other hand to the refinement and validification of computer simulation programmes for the implantation process. This was vividly demonstrated by the extensive discussion during the workshop on the amorphisation of silicon and the properties of the amorphised material.

**J.A. Pals**, *Philips Research, UK*
**B. Stritzker**, *Jülich, FRG.*

# More Funds for Physics from the EC

The European Communities' main funding programme for research and technical development is called the Framework Programme 1987-1991. It has a budget of 5.4 GECU of which about 290 MECU is assigned to programmes that aim to promote scientific and technological cooperation.

The Research Ministers of the European Communities approved in December 1989 a new Framework Programme 1990-1994, with a budget of 5.7 GECU, that overlaps the earlier programme. It is divided into three areas (enabling technologies, management of natural resources, management of intellectual resources). Some 748 MECU are earmarked for industrial and materials technologies, essentially following on from the current BRITE/EURAM Programme. The last item has as its main activity "human capital and mobility" or Researchers' Europe which aims to provide the European research system with trained human resources. The total budget is 518 MECU, a very substantial increase over the equivalent for the first Framework Programme. It combines several existing programmes and adds some new initiatives, including the annual award of postgraduate fellowships and support for European conferences.

*Europhysics News* will monitor how the new funds for the follow-on programmes are to be spent as details filter out of Brussels.

# CEC Support for Conferences

Funds up to a maximum amount of 25,000 ECU to meet the cost of a conference, school or workshop may be available from the Directorate General for Science, Research and Development (DG XII) of the Commission of the European Communities through SCIENCE PLAN 1988-1992. The conditions that must probably be satisfied if an application for financial support is to be successful have been clarified in the course of discussions between the Society and the Directorate. It is perhaps useful to point out that members should take advantage of this information. Moreover, the administrative links which have been established can be used as an efficient and effective means for coordinating activities with DG XII. EPS members seeking support for conferences and the like from DG XII in general, and SCIENCE PLAN 1988-1992 in particular, are therefore asked to seek advice from Gero Thomas before submitting proposals. One should note that there are no fixed dates for their submission to SCIENCE PLAN 1988-1992, but that up to about four months are required before a decision is announced.

SCIENCE PLAN 1988-1992 will continue under the recently approved Framework Programme 1990-1994 but with the title "Researchers' Europe".