Want to know what is happening in solid state physics? Here's where to look

Above A fountain with the statue of a student reading a book and being literally brainwashed by it– perhaps a strange feature for Leuven in Belgium, home to many students, home to one of Europe's oldest universities, and home to the recent general conference on condensed matter. (At least during the conference this August, the water was turned off)

Leuven Lovefest, August 1997

Europe's latest general condensed matter conference centred on the physics of semiconductors and insulators, low temperatures and superconductivity, magnetism and metals, soft matter and statistical mechanics, surfaces and interfaces. **Yvan Bruynseraede** and **Jozef Devreese** take us through the details

In his masterful opening lecture, Pierre-Gilles de Gennes took us on a guided tour to analyse metastability of a thin water film on a hydrophobic surface. Those phenomena not only are of practical importance for many applications (protection of crops, four-colour offset printing, *etc*) but also provide useful conceptual ingredients for the understanding of the internal mechanisms of self-organization which are widely exploited in manufacturing novel structures.

New physical phenomena in novel nano-crystalline or nano-structured materials constituted one of the central points of the conference. The impact of this new emerging field can be judged from the large number of contributions. Artificial metallic superlattices, for example, exhibit many interesting phenomena and have been used as model systems to investigate long range periodicity. Although Ivan Schuller (San Diego) occasionally seems to consider theorists a mixed blessing, one of his conclusions was: "Theory needed". Theory in the spirit suggested by Schuller was certainly presented by Roberto Car (Lausanne) in his *ab-initio* study of a novel class of man-made nanoscale materials with fascinating mechanical and electronic characteristics represented by graphitized cylindrical tubules of pure carbon or by combinations of carbon, boron and nitrogen.

New physical methods to characterize substances at the atomic scale include different types of microscopy and also an atomic resolution X-ray holography, as convincingly reported by Miklós Tegze (Budapest). New physics in reduced dimensionality was manifested through images of electron density waves using the Scanning Tunnelling Microscopy (STM). In his delightful lecture, Ward Plummer (Oak Ridge) showed how Fourier transforms of the real space STM topograph produce direct images of Fermi contours. His leitmotiv was the statement by Anderson and Tosatti: "Charge Density Waves are nothing else but undamped Friedel oscillations" (*see page 149*).

In this overview we probably missed a contribution which later might turn out to be the basis of a major breakthrough. We can only hope this is indeed the case

A promising approach for the analysis of dynamic surface processes, consists in the observation of surfaces on the atomic scale over a wide-range of temperatures with a 'temperature-programmed' STM. This method allows you to keep a particular area on a metal surface 'in view' during changes in specimen temperature of several hundred degrees. Joost Frenken's (Leiden and Amsterdam) impressive high-speed movies of the creation, annihilation, and diffusion dynamics of surface defects have been recorded with the STM.

With the help of their Advanced Photon Source, Sunil Sinha (Argonne) and co-workers have been able to realize innovative photon intensity correlation studies to explore the onset of phase transitions in confined liquids such as the glass transition or microphase separation.

Many-body physics and investigations of phase transitions are characterized by a vivid development of interdisciplinary approaches. An extraordinary example is a suggestion by H. Godfrin (Grenoble) that the formation of cosmic strings would be analogous to vortex creation in liquid He_3 following a rapid transition into the superfluid state.

A special session was organized to commemorate 45 years of type-II superconductivity and 40 years of vortex lattice formation. The development of this field was reviewed in a marvellous talk by Alexei Abrikosov (Argonne), who theoretically predicted those phenomena. His pioneering ideas turned out to be a source of new achievements represented at this conference, *eg* imaging by STM and Lorentz microscopy are sensitive probes for the electronic vortex core structure.

In the parallel symposia, with the invited lectures and other oral communications, many inter- *continued on page 166*