for one surface orientation of silicon. The growth of semiconductor systems by molecular beam epitaxy (MBE) will be included in the Symposium programme. MBE has caused much excitement since it allows an excellent opportunity for *in situ* crystal growth characterisation, and the fabrication of novel semiconductor structure, of great potential interest to the theoretical and experimental physicist.

The organisation of the Phase Transitions Symposium at York allows a good opportunity to bring together experts from that field with surface scientists, in joint session, to discuss the emerging area of surface magnetism and phase transitions. Although the reconstruction of semiconductor surfaces is well established, the occurrence of similar phenomena in the case of metals has long been the subject of controversy. Recent evidence for metal surface reconstruction and the occurrence of two dimensional order-disorder and phase transition-like phenomena in absorbate layers will be presented and theoretical models of these systems will be discussed during the Surface Physics Symposium.

*C. J. Todd*

# Symposium A: Modern Optics

The Modern Optics Symposium will combine some of the features of a review meeting with those of a specialist conference. There will be five sessions comprising solicited papers as detailed below, and three poster sessions for contributed papers.

Echoing the overall theme of the Conference, the solicited papers have been selected with special attention to areas of expected scientific growth, and will provide an authoritative review of current trends. The Symposium has been structured to ensure an orderly coverage of the field of modern optics, and to attract a wide international audience.

The Poster Sessions will provide a forum for original contributions, and to aid topicality the submission deadline for extended abstracts has been set reasonably close to the date of the Conference.

The main topics of the Modern Optics Symposium will be :

(1) Newer non-linear effects in atoms, molecules and solids and their interpretation, including multiphoton transitions, super-radiance and the efficient generation of optical harmonics.

(2) Latest advances in lasers and laser techniques, especially relating to very short wavelengths with the possibility of high-resolution spectroscopy of tightly-bound electrons ; to very high powers leading to a possible approach to harnessing nuclear fusion to generate energy if the formidable technical problems can be overcome ; and to ultra short pulses which can be applied to investigate relaxation processes in macromolecules.

(3) Latest advances in optical electronics, especially in terms of the physics and materials involved, applied to optical communication, electronics functions at optical frequencies, data and image processing and storage, and holography.

(4) The wide range of spectroscopic investigation and application which has been opened up by the unique and developing properties of tunable lasers from UV to submillimetre wavelengths.

*L. A. Thomas*

# Symposium B 2: Phase Transitions

The last decade has seen an extensive development of the state of knowledge of critical behaviour at second-order phase transitions, both theoretically and experimentally. On the theoretical side, ideas from statistical mechanics and from field theory have merged into renormalization group theory, which provides an understanding of universality and scaling behaviour, deviating from Landau theory below a marginal dimensionality.

Remarkable progress has recently been made in the calculation of critical properties by studying the asymptotic behaviour of high-order perturbations in renormalized field theory. Other new developments concern the coexistence of domains, soliton-like behaviour of domain walls, and the topology of defects in the order parameter field. It is in this context of order parameter fields and their singularities that intimate contact is made with elementary-particle physics, and it is hoped that this will lead to fruitful cross-fertilization. An invited lecture on Phase Transitions and Quark Confinement will illustrate some aspects of this relation.

The theory of spatially varying order parameter fields has found an interesting application in the study of structures incommensurate with the crystal lattice, and their transitions to commensurate structures. Some problems connected with such incommensurate phases will be reviewed in an invited lecture.

The dynamical behaviour in the critical region of a phase transition is of particular interest, both because of the phenomenon of critical slowing-down of the order-parameter fluctuations, and of their interaction with hydrodynamic modes resulting from conservation laws. Most theoretical studies assume phenomenological equations of motion for the order-parameter field, but attempts have already been made to start from the microscopic motion of the system. Experimentally, a large supply of information is available from inelastic scattering of neutrons and of light, from ultrasonic experiments, and from various resonance methods. Still unresolved is the question of the existence of an intrinsic central peak of the dynamic structure factor. An invited lecture will review some aspects of recent developments in critical dynamics.

Important problems arise in connexion with defects and with disordered systems. For all experimental methods using impurity atoms as probes to measure the local critical behaviour of the host crystal, it is essential to know how this behaviour is changed by the impurity. The possibility of a condensation of a local order parameter at the impurity above the phase transition of the host, and the nature of such a locally condensed state is another interesting problem. Furthermore, impurities will contribute to the bulk critical behaviour, and may be responsible for a central peak of the dynamic structure factor.

Disordered systems pose a number of interesting questions, such as: Will the transition remain sharp? How will the critical behaviour change for various types of disorder? Can disorder give rise to new phase transitions? One such transition which has been predicted to occur for certain types and amounts of disorder is the transition to a "spin-glass phase" with uncommon type of ordering. An invited lecture will review the situation in the spin-glass problem.

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