

inhomogeneities has also been considered. Experiments are so far mostly done in the strongly turbulent regime, so that a reliable comparison with the theory cannot be made, yet.

Problems of turbulence in magnetically confined plasmas were not addressed systematically; instead the communications in this field covered a certain number of specific topics. P.K. Kaw (Princeton) discussed the problem of disruptions in tokamaks. He considered, on the one hand, couplings between tearing modes and drift wave turbulence, and on the other, the effect of plasma flow towards the tearing-unstable layer, both effects resulting in an increase in the growth rate of the tearing instability. In another paper of the same author, non-linear effects in the lower-hybrid heating mechanism were discussed. H. Cotsaftis gave an account of a macroscopic approach to the non-linear dynamics of Joule-heated toroidal discharges which is based on the introduction of certain invariance properties. The theory of anomalous transport, one of the most important but still very rudimentary fields in magnetic plasma confinement, was represented by a contribution on the diffusion of a multi-species plasma due to drift waves, presented by K. Nishi-

kawa, and by a review of the state of the art for high density pinches by R.C. Davidson.

Also as far as applications to astrophysical problems are concerned a few selected topics were treated by D. ter Haar, S. Ichimaru, and C. Montes. D. ter Haar showed how non-linear effects can stabilize density waves which explains the structure and the observed long life-time of galaxies. S. Ichimaru treated some problems of plasma dynamics relevant to the behaviour of pulsars, whereas C. Montes presented a kinetic theory of photons, showing that induced non-linear Compton scattering on electrons leads, at high photon intensities, to a soliton-like distribution of the photon frequency distribution.

Of course, there was a relatively large group of papers addressing various more fundamental aspects of non-linear plasma theory, like the dynamics of three-wave interactions and effects of non-linear interactions between waves and particles in different circumstances. As it would go too far to enter into a detailed discussion of all the contributions to this field, in which many interesting developments have been reported, let us just mention a paper by D.D. Ryutov here, who

discussed linear and nonlinear Landau resonance mechanisms in various macroscopic systems from a unified viewpoint. Upon noting that Landau damping is a general phenomenon in systems where different degrees of freedom can be associated with different kinds of oscillators, being able to enter in resonance if certain selection rules are satisfied, he treated a number of examples (including the propagation of acoustic waves in a glass of champagne).

In conclusion, the Symposium has shown again that the research on non-linear plasma phenomena is a very active field, into which a large effort is invested and where new results are produced at a high rate. However, the intrinsic difficulty of the topic is such that much more work will be needed to come to a satisfactory understanding of the experimental facts, in particular, those regarding strongly turbulent plasmas.

The success of the Symposium induced the hope that it might be possible to repeat encounters of this kind regularly. Sincere thanks are due to the organizers and sponsor for having provided this first and very fruitful opportunity.

J.L. Bobin and F. Engelmann

Nuclear Orientation

A pleasantly intimate Europhysics study conference (about 60 participants) on nuclear orientation was organized from 12-16 July, principally by members of the Clarendon Laboratory where nuclear orientation (N.O.) of radioactive atoms was first detected in 1954, and where N.O. techniques have been actively practised ever since. The planning of the meeting was impeccable, and the timetable, consisting of a limited number of invited papers with lengthy discussions and numerous coffee breaks, deserves to be imitated by anyone organizing a meeting on this scale in the future.

Topics ranged over all aspects of low temperature N.O. detected by nuclear radiation. The technique as applied to impurities in ferromagnetic metals by measuring γ ray anisotropies is well established, and a large number of experiments have now been done on the destruction of the thermal orientation using NMR on the radio-active isotopes. Developments dis-

cussed included the possibilities offered by a lower range of temperatures (below 1 mK, compared with 3 to 10 mK for most present day work), the advantages and disadvantages of β detection, source preparation by implantation, recoil or on-line methods, and the use of pulsed NMR.

Recent applications in the nuclear physics field include the measurement of nuclear moments of isotopes with a few hours half-life thanks to top loading cryostats, and on-line measurements where oriented samples are bombarded with polarized neutrons or particle beams. In the solid state field, there was active discussion on the use of nuclear orientation as an absolute low temperature thermometer, and on experiments in non-ferromagnetics — dilute magnetic or non-magnetic metals in high applied fields, and even non-conducting anti-ferromagnetic systems. In the ferromagnets, the relaxation time of the nuclei, adiabatic passage results and possible ferromagnetic Knight shifts

continue to provide unsolved puzzles for N.O./NMR.

The N.O. technique now seems to have achieved adult status thanks to recent advances in low temperature technology and in nuclear electronics. It now appears possible for it to be a tool in any laboratory which needs it, instead of a rather mysterious art restricted to the initiated few. As a "standard" technique, N.O. would seem to have a rosy future before it.

Not the least of the pleasures of this meeting was the opportunity of tasting (or re-tasting) the joys of Oxford and its surroundings. The banquet took place on a boat going down the Thames from Folly Bridge to Godstow, following precisely in the path of Lewis Carroll who, on the fourth of July 1862, rowed the same stretch of water in the company of Alice Liddell. From "Through the Looking Glass" to parity non-conservation...

I. Campbell