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This was a very good conference, both scientifically and socially. Mr. Chairman, Mr. Secretary, I shall not repeat the compliments made by previous speakers. The feelings of great appreciation for this extremely well run conference and gratitude for the tremendous hospitality are sincere and living in our hearts.

I wish to digress a little on my statement that this was, scientifically, a very good conference because of certain feelings of uneasiness several of us had a few years ago as to the future of semiconductor physics. At that time semiconductor physics clearly showed the signs of an aging subject: There was the continuous increase of accumulated knowledge and data, the increasing diversification, the great amount of more or less interesting detail and the absence of really great new ideas and concepts about the nature of semiconductors. All these signs are still there. Knowledge continues to increase. Values of bandgaps, bandstructures, effective masses, spin-masses, mobilities, phonon-electron coupling constants, optical parameters and what more there may be, are now available for a great number of substances. In fact we often use these figures without remembering in detail the great amount of hard and skilful work that has been done in order to obtain them.

As to bandstructures some of us remember the Amsterdam conference in 1954. I hope you don't mind that I single out this particular conference of the good old days when it was still possible to follow the whole conference and to understand what was being presented. At that time the theoretical work on the bandstructures of Ge and Si became available and the magnetoresistance and first cyclotron resonance experiments made quite clear that these things were real and of overriding importance for the understanding of semiconductors. Now bandstructure calculations are coming off the computers like T. V. sets off the production line. We can take them seriously, but fortunately also powerful experimental methods exist to check them. Take the case of As for instance. The predicted hole bandstructure is a nice little animal: it looks not too complex and is not trivial. At this conference cyclotron resonance experiments and de Haas-van Alphen oscillations have been reported which serve to fix the Fermi-surface of this semi-metal more precisely. Semimetals and low bandgap semiconductors have some special advantages for the study of bandstructures: a relatively small amount of doping can bring about relatively large changes in the area and the shape of the Fermi-surface. Among others, experiments on doped Bi and As have been reported at this conference. The presence of additional bands near the Fermi energy of these substances can also be investigated by tunneling experiments. From the reports at this conference I get the impression that there are still a number of details to be sorted out here and that in particular the interpretation of structure near zero-voltage is still open for discussion.

Less orthodox semiconductors are also being studied more precisely. There were, for instance, two contributions on GaSe dealing with magneto-optical effects and leading to values of the exciton binding energy and effective masses. Tellurium is very much in vogue too: Shubnikov-de Haas effects, ultrasonic amplification and acoustoelectric effects were reported on this material, also characterized by its interesting non-linear optical properties.

There was a considerable amount of interesting detail at this conference: As an example I mention the work of Kawamura on magneto-plasma-modes in Bi, showing damping where it should not occur according to phenomenological local theory. It occurs because of the mean free path of the carriers and, therefore, the experiments make it possible to derive the Fermi velocity of the carriers and in turn again effective masses. This type of exciting detail shows that semiconductor physics is still fun. Nevertheless there are still many gaps to be filled, much detail to be sorted out. Quantum transport theory is in a very good shape, the experimental evidence for the predicted T and H dependences of the transport coefficients is however still meagre. Scattering theory in more heavily doped semiconductors and semimetals is still not too well developed and much is still to be done here.

Much new knowledge and many details have been obtained by means of more refined techniques and more powerful tools: The importance of optical modulation techniques (piezo- and electro-reflectance), high magnetic fields and the use of lasers for Raman- and Brillouin-scattering and not to forget better materials, has been stressed many times.

Thus we clearly still have much accumulation of data, much interesting detail, but, it is fair to say, also no entirely new and revolutionary ideas, unless we wish to make an exception for the superconducting semiconductors. Nevertheless, if some of us, in previous years, have got the impression that semiconductor physics is a dying subject, it seems now time to revise this opinion: there is a definite change of scenery perhaps even a turning point in semiconductor physics.

Let me digress a little on this. In the first ten years of semiconductor physics the emphasis was on the study of the properties of the materials and the understanding of why these properties are as they are. We now see that, because of the great amount of available knowledge, we are able to "train" the materials, to make them do what we want, to bring them precisely in that condition we want them to be in because we then expect interesting things to happen. Let us take an example from the conference: Magnetoresistance oscillations are reported which occur in InSb when brought in such a magnetic field that a Landau level of spin splitting equals the L.O. phonon frequency.

The level crossing or rather repulsion that then occurs in the system has been observed by infrared band to band magneto-absorption. Hot electron energy losses in InSb in the quantum limit are reported to be particularly high if the L. O. phonon frequency is a multiple of the cyclotron resonance frequency.

Our ability to make semiconductors do what we want has also stimulated the research in wave propagation in solids. The dispersion relations resulting from the coupling of the different phonon-branches with plasma waves, electro-magnetic waves and spin waves are now actively studied. There is considerable complexity, especially if a magnetic field is present, so that even our experts became engaged in a lively discussion during the conference on the degree of a dispersion equation to be used in an experimental set up where the boundary condition provided the necessary coupling between different modes of propagation. Helicon waves are particularly interesting as the damping shows oscillations as a function of H, which provides further information on bandstructure parameters. Not everything is clear here though, and the propagation of helicon waves in finite samples presents its own problems. Detailed insight, better tools, better understanding of wave propagation and coupling have prepared the ground for a development which, in my view, may be a turning point in semiconductor physics: the renewed interest in situations where the material is completely and essentially out of thermal equilibrium. On the hand we have the phenomena of wave amplification due to strong electric fields, which can still be attacked by a linearized non linear theory, on the other hand the highly non linear effects like the Gunn-effect (in which mainly the electrons are completely out of equilibrium) and the acoustic domain propagation in piezoelectric crystals (where both electrons and phonons are out of equilibrium). Many effects of this type were considered to be "dirty" effects a couple of years ago. Now they can be studied fundamentally and there is a clear beginning of understanding of these complex phenomena: the movie picture of the "computer experiment" on the Gunn-effect obviously is not merely an impressive show; the optical investigation of the acoustic domains (both with classical optical means and with lasers) are exciting. The ability to measure phenomena happening in 10^{-9} sec is going to pay off heavily here. The importance of these phenomena was not underestimated at this conference: there were sessions on hot electrons, plasma instabilities, acoustic domain propagation and current instability. These subjects now rightly deserve a great amount of attention. After all, much modern semiconductor physics started with the phenomenon of electrons and holes being out of equilibrium with local variation of the degree of disequilibrium. It has been the basic discovery for the promotion of our branch of science. It may well be that the complexity of the sort of non-equilibrium phenomena now being studied and the rich variety of effects that may follow from them will mark the future development of semiconductor physics. I have no doubt that they will give this field a new lease of life. If these remarks have some bearing on the present and future situation we can expect many more very interesting semiconductor conferences in the future.

With these hopeful words, Mr. Chairman, I wish to end this account of my impressions of this most inspiring conference.