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TRENDS IN PHYSICS

Some personal views of the current lead points in physics presented by senior members of the EPS Divisions with special reference to the: 5th General Conference, Istanbul, 7-11 Sept. 1981

Rendez-vous: Istanbul

1981 is General Conference Year — the fifth in the history of the EPS — and a year in which we hold the General Meeting of our members.

The General Conference has become recognized as a major event in physics. As the title "Trends in Physics" indicates, the Programme Committee has attempted to arrange a review of significant recent developments over the whole field, presented at a level which is comprehensible to all physicists. Such reviews are increasingly useful as the continuous expansion of our subject forces us into an undesirable, but frequently also unavoidable specialization. In this issue of *Europhysics News*, representatives of the EPS Divisions offer us a foretaste of some of the exciting topics in physics which will be presented at the Conference.

Perhaps the most important aspect of the General Conference is the opportunity which it affords for informal contacts between physicists from all over Europe, and indeed also from many non-European countries. The concern which we feel that science should be used for the enlightenment and benefit of all mankind is reflected in the discussions and workshops on the relationship between physics, education and society which are included in the programme.

The General Meeting is also a special occasion. It provides the only opportunity for our members to exchange views on the EPS, its status, aspirations and development. Accordingly, the agenda will be arranged so that the reports of the officers of the Society will be kept as brief as possible, in order that the members should have an adequate opportunity to express their views.

I wish you all a peaceful and prosperous 1981 and look forward to seeing you in Istanbul in September.

A.R. Mackintosh
President of EPS

Atoms in Highly Ionized States

H.W. Drawin, Fontenay aux Roses

Highly ionized atoms play a fundamental role in both astrophysical and laboratory plasmas, especially in fusion-oriented plasmas, and in other branches of plasma applications. Atoms, neutral and ionized, have a direct influence on the thermodynamic state of a plasma and, thus, on its emission properties.

Under most laboratory and many astrophysical conditions, the plasma's state deviates from local thermodynamic equilibrium (L.T.E.), the deviation in general increasing with temperature and decreasing with particle density. As the latter is mostly fixed (within limits), the changes of temperature are the more significant. In order to describe the thermodynamic non-equilibrium state locally and temporally, and especially the spectral dependence of the local instantaneous emission coefficient, recourse is made to models whose input depends directly on atomic properties (such as Einstein coefficients, oscillator strengths, cross-sections, ...) together with more specific data for special purposes. Owing to the peculiar properties of high-temperature plasmas, it is only possible to interpret some measurements through the use of such models.

In the solar corona, for example, where the temperature is of the order of $kT \approx 100$ to 200 eV, one finds up to 14 times ionized iron atoms. Tokamaks, laser-produced and low-inductance spark plasmas on the other hand, now reach temperatures of the order of keV and, thus, permit the ionization of atoms to much higher charge states: in Tokamaks, spectral lines of Fe XXV and Mo XXXII have been observed. Information on many new atomic states is thus needed for plasma diagnostics and plasma modelling. At the same time, these new types of high-temperature plasma, open to physicists a new field, as the observed spectra can be used for testing theoretical structure and collision data, and for stimulating new research work in the fields of atomic

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