

Flashing Lights

The Perception and Application of Flashing Lights. (International Symposium held at Imperial College, London, under the joint auspices of the National Illumination Committee of Britain and the Applied Optics Section, Imperial College, April 1971.) Pp. x+429. (Adam Hilger: London, September 1971.) £7.

THE use of flashing lights to attract attention and transmit information is now very widespread, especially during travel by sea, land, or air, and is undoubtedly a matter of considerable practical importance. The primary objective of this symposium was to bring together the scientists and engineers concerned with the design of flashing light signals with those who use such signals, and with those engaged in studies of perception. Participants at the symposium thus came from a wide variety of disciplines, and the meeting was divided into six sessions, dealing with the visual perception of flashing lights, general, marine, road and rail, and aviation applications, and future research possibilities.

The result is an intriguing juxtaposition of theoretical and practical articles, but with little cross-talk between the two. At the practical level, for example, we are given details of the electrical circuits used in the flasher indicators of cars, the mechanical construction of occulting hood lighthouse lamps, and the design of anti-collision lights for aircraft. This practical approach is also well exemplified by a paper devoted to the perception of short flashes, one purpose of which was to see whether the length of the flashes given out by US Coastguard battery-powered buoys could be reduced by a third, with a consequent saving of \$500,000 each year. Interspersed with such papers are contributions on visual perception quite unconnected with any application. Thus there are papers dealing with the Bezold-Brücke phenomenon and theoretical models of the absolute threshold, and there is a contribution (for some reason appearing in the middle of the session on road and rail applications) which describes a theoretical model of the visual system to account for the perception of apparent motion.

The lack of standardization of flashing signals comes out very clearly in this symposium. The standards specified for motor vehicle lights differ between European countries, and even more widely between them and the USA, and there is still less standardization of airport lights. This is particularly important for aircraft, which pass rapidly from country to country, and apparently a pilot's first problem on seeing a light from the air is not to get information from it, but

to decide which system it forms part of. Economics come into this also, and at one point it is suggested that the air industry cannot afford not to improve its safety record because the cost (in money) of accidents is now too high: deaths appear to be a secondary consideration! The general impression from many of the chapters is of a world filling up with more and more flashing lights, each one made stronger than its predecessors in an effort to make it stand out from the visual chaos that forms its background.

Theoretical concepts and studies seem to have made disappointingly little contribution to the solution of these practical problems, most of which have been studied empirically. This is probably partly due to the unrealistic situations used in the laboratory, where attention is commonly controlled by fixation lights and visual thresholds are usually measured. In practical situations, however, the lights are often well above threshold, and attracting attention is a major problem. If this symposium does indeed lead to more contact between engineering and the academic study of perception it will have fulfilled a valuable function.

W. R. A. MUNTZ

Radiation Physics

Atomic and Molecular Radiation Physics. (Wiley Monographs on Chemical Physics.) By L. G. Christophorou. Pp. x+625 (Wiley Interscience: London and New York, July 1971.) £10.50.

THE study of the interaction of low energy particles and radiation with atoms and molecules has been a field of intense activity in recent years, largely as a result of the development of new and elegant experimental techniques which depend on sophisticated instrumentation, including high resolution electron spectrometry, phase sensitive detection, microwave methods and so on. The measurement of the cross-sections of the many processes of interest has been extended down to particle energies of a few electron volts or less and a remarkable and previously unsuspected series of resonances involving the formation of short-lived compound states has been revealed. Indeed, low energy electron collision physics has been to some extent dominated by the study of this resonance formation in a surprisingly analogous way to elementary particle physics at energies 10^8 times as great.

Recent work in the interaction of electrons and photons with atoms and molecules is reviewed in this monograph. Most of the book is concerned with interactions of electrons or photons of energies less than some hun-

dreds of electron volts but the first chapter deals with the processes involved in the interaction with matter of electromagnetic radiation of much higher energy and the rate of energy loss of energetic charged particles. This is followed by a detailed account of the interesting work on the measurement of the mean energy required to produce an ion pair by charged particles in matter, where in some cases the values obtained are markedly affected by very small impurities in the medium as a result of secondary ionization due to collisions of the second kind between excited atoms and impurity atoms of lower ionization potential. After an account of recent work on the interaction of photons with atoms and molecules, two long chapters are devoted to elastic and inelastic electron scattering processes. The chapter on elastic scattering deals at considerable length with results obtained using swarm methods most appropriate for electrons of very low energy. Beam methods are discussed comparatively less fully.

Subsequent chapters discuss at length the processes of negative ion formation and the measurement of detachment cross sections from negative ions and of electron affinities. The interactions of neutral and heavy charged particles—a field in which there is at least as much activity as in electron interactions—are dismissed in a few pages.

The book contains a very useful description of modern experimental methods in the field and collects together a great deal of data on cross sections, critical potentials, electron affinities, etc. The theoretical description is rudimentary and sketchy although the basic physical processes involved are discussed clearly. The discussion is not limited to the simplest atomic systems. Data on quite complicated molecular systems where the interpretation is much less certain are given and discussed. This is in line with the interest in the study of the interactions of electrons and photons with polyatomic systems in view of their likely importance in basic problems of life science. A short final chapter is indeed devoted to problems of biophysics and bioelectronics; unfortunately the expectation raised by the section headings is not matched by the information contained in the text. This will, however, undoubtedly become a field of great significance in the future and even by including such a brief chapter the author may kindle interest in the subject.

Altogether this represents a competent review of the present position in many aspects of the field and should prove a most useful reference book for the postgraduate student and research worker for whom it is intended.

E. H. S. BURHOP