the cold of the night beats it back again when it striveth to ascend, through which strife and tossing it is fired, (for in this encounter it suffereth an *Antiperistasis*) and being fired it goeth to and fro according to the motion of the Aire in the silent night by gentle gales, not going always directly upon one point, . . .

"These kindes of lights are often seen in Fennes and Moores, because there is always great store of unctuous matter fit for such purposes; as also where bloudie battells have been fought; and in church-yards or places of common buriall, because the carcases have both fatted and fitted the place for such kinde of oyly Exhalations. Wherefore the much terrified, ignorant, and superstitious people may see their own errours in that they have deemed these lights to be walking spirits; or (as the silly ones amongst the Papists beleeve) they can be nothing else but the souls of such as go to Purgatorie, and the like. In all which they are much deluded: For souls departed (Eccles. 9. 5, 6.) cannot appeare again: . . ."

At the end of this quotation Dr. Harvey adds: "there can be no doubt of the religious affiliation of the author." Many similar quotations could be repeated here if we had the space. For all those who become interested by this review there is only one recourse to be taken—have a look at the book itself. I'm sure they will be rewarded.

All my praise doesn't mean there is nothing to be criticized about this scholarly volume. In fact, one of the criticisms which may be leveled against it is that it is almost too scholarly. It abounds in quotations. There are hardly any pages where there are not two or three extensive quotations given. For those, who like myself prefer their quotations readable, there is one reassuring appearance, all the quotations are translated into English and given in English only. This practice I approve of because I like a continuity of reading and not jumping from one language to another, even though I may be familiar with the original language.

The volume has been very handsomely produced by the American Philosophical Society. One irreverent question has to be raised. There are many places in this volume where footnotes call attention to the fact that some illustrious man, versed in the study of luminescence, has been a member of the American Philosophical Society. Is that kind of advertising really needed for such a venerable society?

Elementary Wave Mechanics with Applications to Quantum Chemistry (2nd Edition). By W. Heitler. 193 pp. Oxford U. Press, New York, 1956. $2.90. *Reviewed by H. Primakoff, Washington University.*

Heitler's little book is an introduction to quantum theory from the Schrödinger wave mechanical viewpoint with particular emphasis on applications involving the interpretation of the homopolar chemical bond. A general discussion is also given of the theory of valence including a treatment of directional effects and of the origin of chemical activation energies. The book opens with chapters on the experimental basis of quantum

mechanics and the derivation of the wave equation, and on one- and two-electron atoms including a discussion of angular momentum (orbital and spin), the formulation of the Pauli exclusion principle, and a sketch of stationary state perturbation theory. Chapters then follow on the periodic system of the elements and on diatomic molecules.

These introductory chapters are clearly written and quickly accustom the reader to the ways of quantal thinking—the mathematical aspect of the subject is everywhere kept to a minimum and various illuminating qualitative arguments are described. The sections on the wave-particle duality, on electron spin, and on the dependence of the electronic Coulomb energy on the symmetry of the orbital wave function struck the reviewer as particularly lucid. On the other hand, no account is given of the calculation of transition probabilities—time-dependent perturbation theory is not even mentioned while only four pages are devoted to the time-dependent Schrödinger equation. As a result, no treatment of quantum dynamics is really included, the book being essentially on quantum statics only.

The core of Heitler's exposition lies however in the discussion of the elements of quantum chemistry contained in the last third of the book. Here, the ultimately electrostatic forces holding atoms together in a covalently bound molecule are treated from the point of view of the atomic orbital approximation first introduced by Heitler and London. The saturation properties of the covalent bond, the relation of the total spin of the various *L-S* states of the low electronic configurations of an atom to the valency of that atom (with particular reference to carbon), the connection of the spatial character of the electronic wave functions to the bond directional properties, the physical justification of the schematic structural formulae of simple organic compounds (e.g. H—C≡C—H) are all discussed in a masterly, though of course essentially qualitative, fashion. Nevertheless it is a pity that Heitler gives no indication of the power and scope of the rival molecular orbital method in the treatment of covalent bond problems particularly in view of the applicability of this method to the description of the electronic states of macromolecules and solids. Summing up, however, the reviewer can only quote Heitler's last sentence: ". . . it can thus be said that wave mechanics is the tool for a complete understanding, on a physical basis, of all the fundamental facts of chemistry.", and recommend the book strongly to any prospective student of the subject.

Quantum Mechanics (2nd Edition). By F. Mandl. 267 pp. Academic Press Inc., New York, 1957. $6.50. *Reviewed by J. C. Polkinghorne, University of Edinburgh.*

It is not surprising that Dr. Mandl's book first published in 1954 has achieved a second edition. It develops quantum mechanics from the viewpoint of Dirac and von Neumann but its treatment is much more elementary than that contained in the two great classical treatises by those authors. Later in the book the author discusses the applications of group theory to his subject more fully than is usual in elementary texts. Thus we have an introductory textbook presenting its subject with admirable clarity and in such a way that the student is prepared for the more advanced reading that must follow.

These merits were sufficient to ensure that the book should remain in print for some time. However the first edition omitted some topics which should be contained in a first course. The second edition adds a section discussing partial wave analysis and a chapter giving an elementary description of the Dirac equation, and the result is a good book made better.

Neutron Transport Theory. By B. Davison in collaboration with J. B. Sykes. 450 pp. Oxford U. Press, New York, 1957. $12.00. *Reviewed by E. Richard Cohen, Atomics International.*

The linearized Boltzmann Equation determines the distribution of neutrons in a reactor as well as the transfer of radiation through a stellar atmosphere. In many respects the former application is more difficult than the latter to handle properly, primarily because of the importance of boundary conditions and hence of the non-asymptotic solutions. Yet, in spite of the interest and importance of the field, the literature of neutron transport theory has been meager. Chandrasekhar's *Radiative Transfer* dealt exclusively with the astrophysical aspects and mentioned only in passing that the equations were of importance also in the neutron diffusion problem. Kourganoff's *Basic Methods in Transfer Problems* considered the neutron as well as the photon, but Davison is the first to produce a comprehensive treatise directed exclusively toward the problems of neutron diffusion.

The book establishes the mathematical basis of the neutron transport problem. It is not a treatise on reactors; the physics of neutron diffusion is treated only to the extent required to provide an intelligent basis for the Boltzmann Equation. The major emphasis is on the exact solution of this equation in those instances where this is possible, and the development of approximate methods and series solutions as general methods of attack where exact solution is impossible. *Neutron Transport Theory* is therefore a treatise on the mathematics of the problem rather than the physics of it. From the strictly mathematical viewpoint however, there is a lack of rigor which will bother no one but the mathematician who will himself be capable of supplying the lack. The only serious omission in this regard is the problem of the nonuniform convergence of the spherical harmonic method which has been so thoroughly investigated recently by Kofink (although in honesty to the author it must be admitted that Kofink's work appeared too recently for inclusion).

The comparison between the scope of Davison's *Neutron Transport Theory* and Chandrasekhar's *Radiative Transfer* is interesting and illuminating. Both volumes begin with the same equation and yet there is little du-