and therapeutic or conciliatory among intimates; in relation to cuture, penal law varies directly and conciliatory law inversely with cultural distance and compensatory and therapeutic law dominates in the middle range of cultural diversity; in relation to organization, less-organized people are more vulnerable to penal law, whereas more-organized people can depend on compensatory law.

These patterns of stylistic variation explain, for example, why an offense is more likely to be punished if the rank of the victim is higher than that of the offender but is more likely to be dealt with by compensation if their ranks are reversed, why accusatory law replaces remedial law when communal ties in tribal societies weaken in the course of modernization, why members of subcultures are more vulnerable to law enforcement than conventional citizens, and why business enterprises and administrative agencies usually escape punishment for illegal practices against individuals.

Many of these phenomena have been recognized for a long time; but a number of different theories have been needed to account for all the facts that Black's theory subsumes. Some of these theories, in contrast to Black's, focus on the motivation of individuals, their feeling of deprivation or of marginality, their subcultural values, or their internalization of a deviant identity.

In the last chapter of his book, Black discusses the evolution of law in relation to anarchy. He sees anarchy, or the absence of law, as prevailing both at the beginning of legal evolution in the course of culture history and in the future. But the kinds of anarchy differ. The first kind, "communal anarchy," exemplified (perhaps) by tribal societies, exists among people who live in stable, intimate, homogeneous, and unorganized social settings. The second kind, "situational anarchy," is exemplified by many settings of modern life in the stratified and diversified world of industrial society where many people interact only as strangers in brief, ephemeral encounters. Yet if, according to Black, the present trends continue, the proliferation of law engendered by the increase in stratification, inequality, diversification of culture, and organization in modern nation-states is approaching a turning point. A new kind of anarchy might appear that is neither communal nor situational but a synthesis of the two. With progressing equalization, growing interdependence of people within and across societies, intimacy becoming a situational rather than remaining a communal aspect of social life, diverse cultures undergoing homogenization, and organization loosing its hold on people as their mobility increases, law might gradually be replaced by a mixture of old and new patterns of social control, adapted to the regulation of behavior in a "situational society."

It is not difficult to debate some of Black's assumptions and interpretations, especially in regard to the ethnographic material he has adduced in support of his propositions. But the debatability of particular points does not impair the importance of his theory for a comprehensive understanding of the relationship between law, deviance, and social structure. What remains for future research is the task of scaling his variables so that their relative weight in determining the quantity, direction, and style of law can be ascertained.

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Liquid State Physics

Theory of Simple Liquids. JEAN PIERRE HANSEN and IAN R. MCDONALD. Academic Press, New York, 1976. xvi, 396 pp., illus. $30.65.

Atomic Dynamics in Liquids. N. H. MARCH and M. P. TOSI. Halsted (Wiley), New York, 1977. viii, 330 pp., illus. $39.50.

Both of these books are intended to acquaint the researcher with recent developments in liquid state physics. The book by Hansen and McDonald concentrates on the interpretation of the properties of ideal systems that are generated by computer simulation; the book by March and Tosi is more physically oriented, concentrating on what can be learned about dynamics in liquids by the use of the neutron scattering function. In both books the choice of topics is idiosyncratic. Although the authors' views are well worth recording, neither book offers a unified view of the field or a critical assessment of the literature. It is no doubt premature to expect a unified view of nonequilibrium properties inasmuch as this is still a very active subject, but most people in the field consider the equilibrium properties of simple liquids, such as the rare gases, a closed subject.

About half of the Hansen and McDonald book is devoted to a well-organized and clear discussion of the calculation of the thermodynamic properties of classical liquids. The various integral equations and the diagrammatic expansion techniques, important to perturbation theory, are particularly well covered. The formal manipulations used in the two approaches are described well, although physical insight is lost in the process. In fact, there is not much new insight to be had. Recent developments have led back more than a hundred years to van der Waals's idea that the properties of a fluid are primarily determined by the geometric arrangement forced on the system by harsh repulsive forces. First-order perturbation theory, by which attractive forces are taken into account, leads to the van der Waals theory. Much effort is being devoted to attempts to distribute the total potential of interaction between the reference and perturbation parts in such a way as to achieve a theory in which convergence is as rapid as possible. Convergence is judged by comparing the first-order theory with computer results, since it is difficult to calculate higher-order terms. Much of the fine tuning of perturbation theory has been carried out for normal liquids, although the liquid state covers a wider region of temperature and density.

It is too bad that after describing the whole apparatus of perturbation theory, Hansen and McDonald cover the treatment of binary mixtures only by conformal solution theory, which is of limited applicability. Van der Waals's theories are generally inadequate for mixtures, since excess thermodynamic properties have to be calculated. Hence, higher-order perturbation theories are necessary and appear to lead to real progress in the treatment of mixtures. Other equilibrium properties of simple liquids, surprisingly, are not covered at all, including electrical and optical properties and surfaces. Not surprisingly, the treatment of quantum fluids is practically ignored.

Hansen and McDonald cover phase transitions as an afterthought following their discussion of nonequilibrium properties, and hardly do justice to the recent theoretical developments concerning the critical point. As for melting, the computer results and their consequences are succinctly presented, but the authors fail to point out that of the four or so of the infinite set of integral equations that have been studied, none can distinguish between a solid and a liquid. The lack of a fundamental theory of melting remains the outstanding problem in the study of equilibrium properties.

March and Tosi discuss equilibrium properties only from a structural point of view and only for more complex substances such as metals and water. They devote a chapter each to quantum fluids, critical phenomena, and surfaces, but, as in the Hansen and McDonald book, these subjects are covered only rudi-

mentarily. The chapters on binary fluids and charged fluids are outstanding, comparing calculations with the results of experiments with binary alloys, plasmas, and ionic melts. Even the fascinating, recently discovered electron-hole liquid is discussed. On the whole, however, such structural considerations are viewed only as the time-independent element of the neutron-scattering function.

From the point of view of kinetic theory, the neutron scattering function is the key to understanding the nonequilibrium properties of a fluid. The only results that have been rigorously established concerning this function are its short-time behavior, as given by kinetic theory, and its long-time behavior, as given by hydrodynamics. Its intermediate-time behavior is, at present, basically determined by various semiempirical interpolation methods, through the use of models of the response or memory function, and the determinations are tested against real or computer experiments. March and Tosi give a good account of these procedures, although neither they nor Hansen and McDonald discuss the important recent realization that the time scale for which hydrodynamics is valid is remarkably short and cannot be separated from the kinetic time scale.

Hansen and McDonald describe the modern fluctuation-dissipation approach for the calculation of transport coefficients. They fail, however, to point out that the transport properties and correlation functions can be well approximated by the hard-sphere model, as is the case for equilibrium properties. The hard-sphere results in turn can be well represented by the Enskog approximation, which, at present, is the only way of extending the low-density Boltzmann results to higher densities that can systematically be improved on by graph-theoretical techniques. Such corrections to the Enskog model contain, for example, the hydrodynamic modes that lead to the slow decay of autocorrelation functions and to the prediction of the nonanalytic behavior of the neutron-scattering function. They should not have been omitted. The unwary reader should have been warned that the perturbation technique so successful in equilibrium situations is fraught with danger in nonequilibrium ones.

These books cover a limited approach to a specialized topic. One would like to find in them only truths; not all the truths, but certainly the essential truths.

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Nuclear Astronomy

Gamma-Ray Astronomy. Nuclear Transition Region. E. L. CHUPP. Reidel, Boston, 1976. xiv, 318 pp., illus. Cloth, $39; paper, $19. Geophysics and Astrophysics Monographs, vol. 14.

As the subtitle suggests, Chupp's book is primarily concerned with astronomy in that portion of the electromagnetic spectrum that extends in energy from about 0.1 to nearly 100 million electron volts. It is that portion that contains the energy levels of atomic nuclei and hence exhibits gamma-ray lines, which are due to transitions between nuclear energy levels. Astronomical line spectrometry in this energy interval amounts to nuclear spectroscopy of celestial sources just as measurements of optical and x-ray spectral lines constitute atomic spectroscopy of such sources. The particle energies that are required for excitation of nuclei in the sources, however, are very much greater than those required for atomic excitation. There is widespread expectation that nuclear astronomical information will reveal much that is qualitatively new and different about the most prominent and fascinating problems of astrophysics, cosmology, and solar physics. The chief problem is that the expected fluxes of nuclear gamma rays at earth are so small that they are mostly beyond the detection capabilities of existing experimental techniques. Until recently, there have not been many reports of positive detections of nuclear gamma rays from astronomical sources. (An experiment conducted by Chupp's group is among the few positive detections; his group has been the only one to succeed in detecting nuclear gamma rays from the sun, during solar flares.) Nuclear gamma-ray astronomy is a small field compared, say, to x-ray astronomy. The small number of detections may be one reason for the comparative paucity of nuclear gamma-ray astronomers.

This is the first book devoted entirely to astronomical nuclear gamma-ray spectroscopy. It is written for researchers who are already in the field or are thinking of entering it. Written by an experimentalist, the book assumes that the reader already has some knowledge of nuclear physics and of astrophysics, but it does review the more pertinent material from those disciplines. The book has good summaries of production mechanisms and predicted gamma-ray spectra for continua, as well as discrete (line) emissions from various astronomical sources. There is also a discussion of the mechanisms by which gamma rays interact with matter. A good review is given of the various solar and cosmic observations that have been conducted. The book contains many references to recent research papers, through June 1976.

Perhaps the most useful part of the book, for both observationalists and theorists, is a chapter on the sensitivity limits of existing experiments and the problems associated with increasing sensitivity. The most fundamental problem is the activation of the detector itself by nuclear reactions of bombarding particles. Cosmic rays and other energetic nuclear particles that are present at balloon altitudes and in near-earth satellite orbits cause the detectors to become sources of the radiation one is attempting to detect from far-distant sources.

This volume belongs on the bookshelves of all those who are professionally interested in nuclear gamma-ray astronomy.

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Plant Reproduction

Sexual Interactions in Plants. The Role of Specific Substances in Sexual Reproduction. H. VAN DEN ENDE. Academic Press, New York, 1976. viii, 186 pp., illus. $14.75. Experimental Botany, vol. 9.

The compounds that control sexual interaction in plants have become one of the central concerns of experimental plant physiology during the last 10 years. It has become clear that the specificity characteristic of the sexual process in plants is mediated by chemical compounds, and such substances have been found and identified in algae, fungi, ferns, and flowering plants. In this book, van den Ende, who is an expert on sexual factors in Mucorales, emphasizes hormonal control in Mycophyta. Four chapters dealing with *Allomyces*, *Achlya*, Zygomycetes, and yeasts make up about half the book. The known mediators of sexual interaction in *Chlamydomonas*, *Volvox*, *Oedogonium*, brown algae, and ferns are also treated, and some highlights of the fertilization process in flowering plants are mentioned. Aside from the lack of consideration given to flowering plants, the taxa are treated nicely. Such processes as sex expression, agglutination, fusion, and chemotropic and chemotactic responses are discussed. The chemical compounds that have been identified as controlling sexual interaction in plants (sirenine, trisporic