quately reflect mood shifts, then it is hard to justify their use as a measure of enduring personality structure.

Despite these reservations, many clinicians continue to find the MMPI useful as a measure of impairment and disturbance and as an index of treatment needs, readiness for treatment, and even benefit from treatment. In any event, one of the main reasons why it is possible for three automated commercial MMPI interpretation systems to sustain themselves financially is that a great deal is known about the distribution and correlates of the clinical scales both individually and in profile. And though the shortcomings of the MMPI are known, the answers to the technical and conceptual problems are not yet fully known. For the foreseeable future it will continue to be far easier to offer profound criticisms of this and other such instruments than profound insights enabling them to be constructively revised.

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Neuroendocrinology

Brain-Pituitary-Adrenal Interrelationships. Proceedings of a symposium, Cincinnati, Ohio, June 1972. Z. BRODISH and E. S. REDGATE, Eds. Karger, New York, 1973. xii, 340 pp., illus. $45.30.

The editors of this symposium consider that the pituitary-adrenal system has been overshadowed by other concerns in endocrinology. They hope to attract attention to the present status and future possibilities of research on this system. The result is a volume that should be of interest to those actively engaged in neuroendocrine research.

The first third of the symposium is devoted to an assessment of assays for adrenocorticotropic hormone (ACTH) and corticotropin-releasing factors (CRF). Much useful technical detail is given. Until recently radioimmunoassays were the most sensitive method for detecting ACTH. But radioimmunoassays may pick up both biologically active and biologically inactive material, and the results have to be treated with caution. Better bioassays and a competitive binding assay will, one hopes, solve this problem. A bioassay using isolated adrenal cells has been refined to give a sensitivity of 1 picogram and an excellent index of precision ($\lambda = 0.03$). A competitive binding assay is described in which the natural target organ protein is used as the receptor, although the precision of this method needs to be improved. The development of a sensitive and precise assay for CRF is a more formidable problem since the variability of the pituitary has to be added to that of the ACTH assay. Methods for measuring CRF both in vivo and in vitro are described.

Other contributors present a mixture of review and new data concerning the control of ACTH, but there is little consideration of the adrenal gland other than as a source of steroids to feed back on the control of ACTH.

Only two classes of nonmammalian vertebrates are considered. Reptiles, if they can be judged by the lizards, show both similarities to and differences from the mammals. The teleost fishes, as might be expected, are different since hypothalamic nerve fibers penetrate the adenohypophysis and may be involved in the direct control of pituitary cells. There are enormous areas of brain-pituitary-adrenal physiology to be investigated in the lower vertebrates. It is to be hoped that some of the technical advances reported here will find application to these organisms.

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Air Chemistry

Chemistry of the Lower Atmosphere. S. I. RASOOL, Ed. Plenum, New York, 1973. xii, 336 pp., illus. $22.50.

Mention of the subject *atmospheric chemistry* often brings a rapid response: "you mean smog." While it is true that atmospheric chemistry is important to such problems, there is a lot more to it than urban air pollution. Specifically, as editor Rasool points out, there are serious questions regarding man's impact on the natural evolutionary processes of the whole atmosphere. The basic science of atmospheric chemistry as a multidiscipline is practiced and taught by a relatively small but growing number of scientists. The repertoire of the atmospheric chemist includes not only such obvious topics as measurement of air composition, but also the role of chemistry in atmospheric processes (for example, light absorption and emission and cloud nucleation), cycles of atmospheric substances, the reactions of gases in the atmosphere (including those producing particulate matter), and trends in the chemical processes and properties of the atmosphere. A chief goal of air chemistry is to provide a basic understanding of atmospheric processes on all spatial scales and of how man influences them.

Because of the breadth of this emerging subject, it is natural to limit the focus to the lower atmosphere (the layer of air including the troposphere and stratosphere extending approximately to 30 kilometers of altitude), in or below which man and all life normally exist. Even so, it is apparent that the subject is still too large for this volume, in which only a few selected topics are treated.

The chapter by H. R. Pruppacher reviews the chemical properties and physicochemical processes of cloud and ice nuclei, showing the difficulties and inconsistencies of interpretation of measurements of the latter. R. D. Cadle covers the subject of particulate matter in the troposphere and lower stratosphere. G. M. Hidy surveys the processes that remove gases and particles from air, with strong emphasis on theoretical aspects. The global sulfur cycle—one of the dominant natural cycles influencing air composition and one which is being changed by human activity—is treated in considerable detail by J. P. Friend. S. H. Schneider and W. W. Kellogg consider the role of air chemistry in climate change, including both direct effects on radiation and a more complex variety of important feedback mechanisms. The carbon dioxide cycle is surveyed by C. D. Keeling from the point of view of reservoir models. While there is much more to atmospheric chemistry than these topics, the six chapters complement each other and provide more coherence than is normally found with many different authors.

Because of the high quality of what is included I hesitate to criticize Rasool's book on the grounds that it doesn't cover all aspects of lower atmospheric chemistry. To be sure, the cycles of carbon monoxide, hydrocarbons, nitrogen compounds, and other substances could have been added, as could a variety of other topics such as measurement of air composition and a summary of human influences. My only real criticisms are that the references in some (but not all) chapters seem skimpy and that there is no author

index. The claim on the dust jacket that this book fills the need for a "comprehensive" approach is perhaps misleading. While each of the individual chapters considers man's influence on air chemistry to some extent, it is abundantly clear that the overall effect of past, present, and future human activity is poorly understood and that even the basic chemical processes need further elucidation. Workers in air chemistry will no doubt find extensive use for this book while we await other papers on more topics in the chemistry of the atmosphere, including, it is to be hoped, studies of what man's activities imply for our future atmospheric environment.

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Behavior of Matter

Phase Transitions and Critical Phenomena. C. DOMB and M. S. GREEN, Eds. Vol. 1, Exact Results. xvi, 506 pp., illus. $31. Vol. 2. xviii, 518 pp., illus. $31. Academic Press, New York, 1972.

The understanding of phase transitions and, particularly, the full elucidation of behavior in the vicinity of critical points, where two phases, for example gas and liquid, become indistinguishable, is still a major challenge for the theory of condensed matter. The subject, which cuts across the traditional boundaries of physics, chemistry, and engineering, goes back to the basic thermodynamic analyses of Gibbs and to the approximate and semiphenomenological discussion of the gas-liquid critical point by van der Waals. The first half of this century saw mainly a gradual extension and wider application of these "classical" approaches. It was not until Onsager's dramatic, exact solution of the two-dimensional Ising model in the middle '40's, and the growing awareness of its implications in the subsequent decade, that the serious deficiencies and inadequacies of the older ideas were fully appreciated. The Ising model—which may be interpreted as a model of the gas-liquid transition, of a ferromagnet or antiferromagnet, of a binary alloy, and so on—was found to have a specific heat which diverges to infinity at the critical temperature. Increasingly careful and precise experiments on many systems soon revealed that such "critical singularities" also characterize the real world, even though they are effectively excluded by the classical theories. The dominant roles played by dimensionality and symmetry were also quite unforeseen by the old masters.

The two volumes under review initiate a series which recognizes the recent crystallization of the modern theory of phase transitions and critical phenomena. Four principal threads may be distinguished in the picture which has emerged in the last ten years. The first is formed by rigorous general results based on fundamental statistical mechanics. An excellent review of this area is given by R. B. Griffiths in volume 1: in many instances the rigorous theorems provide only existence proofs, but sometimes they yield sharp and valuable inequalities. Complementary articles by J. Ginibre and by G. G. Emch (on the C*-algebraic approach) describe other strands of this thread. The second main thread follows the spirit of Onsager's work by seeking exact analytical solutions for particular, idealized models. Such models, even when caricaturing physical reality quite severely, have often proved surprisingly instructive and revealing. The remaining chapters in volume 1 are devoted to this quest. The long article by E. H. Lieb and F. Y. Wu on "ice rule" and related ferroelectric models will be especially appreciated by students and specialists since it is the first review of a subject otherwise accessible only through the mathematically forbidding original papers. The chapter by H. N. V. Temperley provides a nice overview of the extensive literature on two-dimensional Ising models, but (apart from the article by B. M. McCoy in volume 2, on randomly layered Ising models) the student will miss, in these volumes, those full explanations that would enable him to understand in detail and to calculate for himself. Knowledgeable readers will also enjoy the articles in volume 2 on finite size and surface effects by P. G. Watson and on the spherical model by G. S. Joyce; both of these contain results not otherwise published. The interesting article by K. Kawasaki on kinetic Ising models is the only chapter in these (and the announced further) volumes which discusses time-dependent phenomena.

The third thread of our current understanding is spun from numerical analyses, especially those based on the extrapolation of the leading coefficients of exact series expansions, by Padé approximant and ratio techniques. This approach, pioneered by the first editor (C. Domb) and his colleagues, is now accepted as yielding the most reliable estimates of the critical behavior of three-dimensional models (which have otherwise proved quite intractable). Aspects of these developments are found in volume 2 in J. W. Essam's article on percolation and cluster size problems and in L. K. Runnels's survey of lattice gas theories of melting. For extensive and authoritative reviews, however, the serious student must wait for volume 3 (now in press), which is devoted to this scientific art.

The final thread is formed of the new phenomenological and approximate analytical theories which supersede the van der Waals and subsequent "mean field" approaches. (Aspects of the latter are reviewed by D. M. Burley in volume 2.) Here we find the concepts of critical exponents and the strikingly successful "scaling" hypotheses for describing the behavior of the thermodynamic and correlation functions close to criticality. These ideas have very recently been given a deeper foundation by K. G. Wilson's powerful renormalization group approach. Apart from a lucid discussion of the interface between coexisting phases by B. Widom and a review of critical equation of state data for fluids and ferromagnets by M. Vicentini-Missoni (in volume 2), the general reader will have to await further volumes in the series for a systematic exposition of these central developments. In the meantime the student may still turn to the standard reviews (L. P. Kadanoff *et al.*, *Rev. Mod. Phys.* **39**, 395 [1967] and M. E. Fisher, *Rep. Progr. Phys.* **30**, 615 [1967]) or, especially for time-dependent phenomena, to the introductory text by H. E. Stanley (*Phase Transitions and Critical Phenomena*, Oxford University Press, 1971) recently reviewed in these pages.

Overall, the editors and contributors have attained a high standard of scholarship and clarity (which is matched by the pleasing appearance of the volumes). This series makes a welcome coming-of-age present to a subject which promises to intrigue and tantalize researchers for some time still.

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