with two- and three-dimensional systems, renders them mathematically more tractable, increases the probability of obtaining exact results, and provides a basis for testing methods that might be applicable to crystals of higher dimensionality. I stress this because, despite the reference to lattices in the title, the book under review is devoted primarily to one-dimensional systems. Since the pioneering work of Dyson in determining the frequency spectrum of a disordered linear chain, there has been a great deal of effort expended by many people, using many different techniques, in attempts to make such determinations and to solve the related problem of determining the electronic density of states of disordered systems. It has recently been recognized that a great many of the different approaches that have been used in studying the spectral properties of disordered linear chains are related, and in fact can be regarded as special cases of a theory which has come to be called the phase theory. It is to the exposition of the phase theory that the greater part of the book is devoted.

The author is one of the principal contributors to the present-day spectral theory of disordered one-dimensional crystals, and this fact is reflected in the authoritative treatment of the subject which this book provides. After two introductory chapters, in which the equations and models that form the basis for all subsequent discussions are introduced and the results of computer determinations of the spectral properties of disordered systems are presented, three chapters are devoted to a detailed description of the phase theory and its application to the determination of the spectral properties of disordered one-dimensional systems. Disordered lattices of two and three dimensions are then discussed; an interesting feature of this discussion is that it includes descriptions of applications of the phase method, or variants of it, to the study of the effects of isolated and extended defects that can occur in such crystals. The concluding chapter of the book is devoted to a description of approximate theories of the vibrational frequency spectra and electronic energy spectra of disordered crystals. This includes Green's function methods, the method of the averaged eigenvalue equation, moment expansions, and the effective mass approximation. The exposition throughout is lucid; the discussions of methods other than that of the phase theory, and of earlier work on various disordered lattice problems, are thorough and fair, with the strengths and deficiencies of these other methods, as well as of the phase method, being assessed fairly. I cannot imagine that anyone seriously interested in the spectral properties of disordered systems will fail to have this book in his library.

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Cold-Climate Phenomena

The Periglacial Environment. Past and Present. Based on the Symposium on Cold Climate Environments and Processes, seventh congress of the International Association for Quaternary Research, Fairbanks, Alaska, Aug. 1965. TROY L. PÉWÉ, Ed. McGill-Queen's University Press, Montreal, 1969. x + 492 pp., illus. $25.

Substantial portions of the nonglacier-covered polar and subpolar land areas of the earth, characterized by perennially frozen ground (permafrost) and other cold-climate phenomena, are widely referred to as periglacial. The periglacial environment has attracted considerable scientific attention in the decades since the Second World War, generated in part by the search for and development of economic resources in the northern regions. Periglacial research has tended to be strongly interdisciplinary owing to the complex interaction of climate, vegetation, topography, and geology in contributing to present environmental relationships. Because the present characteristics of the periglacial environment are the product of both present and past climate and terrain conditions, research has been concerned not only with active processes but with historical reconstructions of past environments as well.

A broad cross-section of the types of periglacial research currently being done is presented in this volume, which is the outgrowth of a special symposium held during the seventh congress of the International Association (now Union) for Quaternary Research (INQUA). The 17 papers are contributions from 33 scientists representing 11 countries. The papers are arranged in two major groups, the first dealing largely with periglacial processes and their products, the second with cold-climate phenomena in now-temperate regions which, because of their paleoclimatic implications, provide evidence of changes of environment through time. Although examples are drawn predominantly from the Arctic and from adjacent subarctic regions of the Northern Hemisphere, several papers dealing with the tropics and with Antarctica have also been included.

The contributions represent a "mixed bag" of topics, some far more closely related to the glacial than to the periglacial environment. Papers dealing with botanical dating of end moraines, isostatic recovery of glaciated regions, and Antarctic glaciation lie outside the main theme of the book. The remaining papers deal largely with a variety of periglacial features, including permafrost, patterned ground, soils, colluvial deposits, and loess. One gets the distinct impression that many of the paleoclimatic interpretations based on such features are made on rather tenuous evidence and that rigorous evaluation of the criteria for climate change in periglacial regions is badly needed. The significance of involutions and presumed solifluction features as climatic indicators is still largely conjectural, yet they are widely used for paleoclimatic reconstructions. On the other hand, several recent studies in northern North America have demonstrated a close relationship between modern periglacial phenomena and climate. For example, Troy Péwé has shown that distribution of modern ice wedges in Alaska is closely related to temperature, and that a mean annual air temperature of −6° to −8°C is necessary for ice-wedges to grow. An analysis by R. J. E. Brown of factors influencing the distribution of discontinuous permafrost in Canada disclosed that continuous permafrost lies north of the 20°F (−6.7°C) mean annual air isotherm, that between the isotherms of 20° and 30°F (−1.1°C) permafrost is discontinuous, and that south of the 30°F isotherm permafrost occurrences are rare. Furthermore, this pattern, which applies both latitudinally and altitudinally, is subject to local departures where terrain variations occur. Such observations are of great importance to the paleoclimatologist, for they permit quantitative evaluation of certain paleoclimatic parameters on the basis of modern analogues and thereby lead to more accurate reconstructions of conditions during former periods of widespread periglacial climate.

Because this volume discusses a variety of subjects and geographic areas,

both the general reader and a diverse audience of specialists should be attracted by it. Regrettably, it is overpriced.

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Shaping a Discipline

Clinical Psychology as Science and Profession. A Forty-Year Odyssey. DAVID SHAKOW. Aldine, Chicago, 1969. xiv + 354 pp. $12.50. Modern Applications in Psychology.

For two decades almost all candidates for the Ph.D. in clinical psychology in this country have followed a four- or five-year graduate curriculum designed to prepare them for *both* research and clinical service. This basic educational design, the result of a unique attempt to affect the character of a burgeoning postwar discipline, is to a large extent the brainchild of the author of these collected essays. Shakow is a senior research scientist at the National Institute of Mental Health and erstwhile chief of its Laboratory of Psychology; prior to his service with the federal government, he was chief psychologist and director of psychological research at Worcester State Hospital and held research and teaching positions at the University of Illinois and the University of Chicago. He is not only a major architect in the shaping of clinical psychology but also a major investigator of psychopathology and a major contributor to the evaluation of Freud, having co-authored with David Rapaport *The Influence of Freud on American Psychology* (1964).

The present volume is a collection of 27 of Shakow's papers, the earliest—"An internship year for psychologists"—dated 1938, the latest a perceptive and only gently barbed 1968 paper "On the rewards (and, alas, frustrations) of public service." His 60 or so research papers are published elsewhere.

Those who are familiar with the development of clinical psychology are likely to appreciate the high drama and frequent audacity represented in this collection. Over the years, Shakow successively took on institutional psychiatry, the research-oriented university departments of psychology, and the American Psychoanalytic Association, among others. His weapons were of a piece with his principles. Although he was constantly arguing for clinical psychology, exactly the same principles he fought for could be applied with profit to the other mental health disciplines. With calm logic and candor, he espouses a clinical psychology devoted to the welfare of the patient, to the imperative need for more knowledge, and to the ultimate improvement of society. It is the quality of the research, the quality of the student, and the quality of the practitioner, not the aggrandizement of his own discipline, that occupy him in these essays.

The occasion for drama lay in the attempts of clinical psychology, encouraged by its wartime expansion, to intrude into some parts of the mental health field which until then had largely been the property of psychiatry. No entrenched profession, and perhaps least of all medicine with its proprietary albeit genuine concern for the health of its patients, welcomes competition from an untested stranger. Shakow's papers describing the qualifications of the clinical psychologist for both research and practice informed many psychologists as well as psychiatrists about the rapidly developing new discipline.

His interest in educating clinical Ph.D.'s for both research and service first appears in his 1938 paper and continues through his evaluation of a national conference held in 1965. That conference again reaffirmed the need for such double preparation. Many academic psychologists had been anything but happy when a committee of the American Psychological Association, chaired by Shakow, issued a report in 1947 recommending the combined training. Nonetheless, the principle was adopted officially by the APA in 1949, and it has been followed in one fashion or another by most of the major American universities which offer Ph.D.'s in psychology (now numbering over 70). The principle is still under attack, but its opponents encounter difficulty trying to outline a curriculum for any kind of psychologist in the latter half of the 20th century which omits a background in research.

The great need for research in psychoanalysis was the basis for Shakow's 1962 paper, "Psychoanalytic education of behavioral and social scientists for research," in which he challenged an earlier edict of the psychoanalysts that excluded all but M.D.'s from training analyses in their institutes. He won.

In order to forestall some chiding from the author, I must hasten to insist that his battles were not fought single-handed but with considerable help from psychiatrists and psychoanalysts, as well as his fellow psychologists. He may also object to the word "audacity" as used above. The only impassioned word in his book is "illegitimati," which Shakow refuses to apply to government bureaucrats on the grounds that it accurately describes only bureaucratic *settings* and *acts*.

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Numerals and Languages

Number Words and Number Symbols. A Cultural History of Numbers. KARL MENNINGER. Translated from the revised German edition (Göttingen, 1958) by Paul Broneer. M.I.T. Press, Cambridge, Mass., 1969. xiv + 482 pp., illus. $15.

Menninger's *Zahlwort und Ziffer* was first published at Breslau in 1934. A much expanded and more lavishly illustrated revised edition appeared in two volumes at Göttingen in 1957–1958 (it was reviewed by D. J. Struik in *Mathematical Reviews* **19**, 517–18 [1958] and **20**, 804 [1959]). The first volume, subtitled "Number Sequence and Number Language," is devoted primarily to a linguistic analysis of counting and numerical word formations somewhat similar to, but broader than, the article by A. Seidenberg on "The ritual origin of counting" (*Archive for History of Exact Sciences* **2**, 1–40 [1962]). The second and stouter volume, with subtitle "Number Symbols and Calculation," describes the origins of systems of numerals and computational methods. Calculations involve integers almost exclusively, and not even the oddities of Egyptian manipulations of unit fractions are included. These two absorbing volumes now have been combined into an English version in a single oversized volume which is as attractive to the eye as to the mind. The typography is excellent, and the wide margins accommodate many of the almost 300 illustrations that grace the text. One regrets, however, that the bibliographies and the chronological table which added to the usefulness of the German edition have not been reproduced here.

The author's evident enthusiasm for his subject is well tempered by sound-