the concepts used in this book ("symmetric spaces," "vector bundles," and "Iwasawa decomposition," for example) are quite adapted to physical situations and concepts and will be very useful. What physicists mainly need, however, are explicit calculations of the representations of specific groups of their problems rather than general theorems, a need not met in this book, nor in any other book.

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Individual Adaptation

Since antiquity adaptation has been recognized as the central problem of understanding and explaining organisms. Final cause, in the Aristotelian sense, only evaded the question and must be either radically redefined or altogether abandoned in scientific pursuit of the subject. That pursuit has shown the concept of adaptation to be extremely complex, to such a point that the word out of context is hopelessly ambiguous. "Adaptation" may mean the process of acquiring a characteristic that is an adaptation. The process may be genetic, in the evolution of populations that are adapted as such, that is, as reproductive continua. In the case of mankind, the process and its adaptive outcome may be cultural, also a phenomenon of populations as reproductive continua and related to genetic evolution because the capacity for culture is genetic and has evolved. Those two interacting aspects of human adaptation were treated with great skill by Th. Dobzhansky in his Silliman lectures at Yale, published as *Mankind Evolving* [reviewed in *Science* **136**, 142 (1962)].

Another aspect of adaptation in general and human adaptation in particular is that individuals adapt. That was the subject of another outstanding series of Silliman lectures by René Dubos, now published as **Man Adapting** (Yale University Press, New Haven, Conn., 1965. 549 pp., $10). This book was prepared as a companion volume to Dobzhansky's, and a simple expression of judgment of both is that they are worthy of their subjects and of each other. It is not necessary to read one to profit by the other, but the profit is more than doubled if both are studied. There is virtually no repetition, but there are complementarity and connection. The genetics of the individual are fixed at conception (for all usual cases), but the capacity for individual adaptation is genetically determined and results from the evolution of mankind collectively and not individually. Furthermore, individual adaptation has two inseparable but different aspects, one biological and the other cultural, just as does populational adaptation. The two also involve both static or homeostatic adaptation to a given environment and dynamic adaptation by changing response to environmental variables and new stresses. Dubos has treated all aspects of individual adaptation with thoroughness, skill, and authority.

For the rest, Dubos's book is so rich in detail and so extensive in coverage that its contents must be indicated rather than reviewed. It starts with man as a product of evolution, a unique product because man's nature is not only biological but also social, his mentality not only reactive but also manipulative of symbols. The individual with these group characteristics develops under his particular influences, pre- and postnatal. He lives in a physical world, reacting rhythmically to its cyclic forces and variously to its climates and other characteristics. Individual responses to nutrition and malnutrition are especially noticeable, and especially modifiable by cultural means.

Discussion of biological synecology and the human social environment introduces a series of chapters on physiological derangement and adaptation, fascinating in depth and with some astonishing tidbits: the indigenous microbiota (absence of an intestinal biota can produce radical anatomical abnormality); nutrition and infection (a surprise here is that dental caries is discussed without mention of fluorides); evolution of microbial diseases (modern medicine has not conquered them; "the morbidity rates of infection have not decreased significantly and in some cases have actually increased"); changing patterns of disease (increase in population density is a possible accelerating cause of disease). In spite of that last bit, the next chapter, "Adaptation and its dangers," points out that mankind has proved to be extraordinarily adaptable and that the general state of health has in fact improved in the thoroughly unnatural conditions of crowded cities. Nevertheless the adaptability of populations is paid for by maladaptation in some individuals, and adaptability itself is a threat if it involves the ability to accept or to produce the destruction of "the values most characteristic of human life."

The topic of population density and human life is familiar enough, but here is a summary free of extremism. (Even though I personally am repelled by the opinion that establishment of permanent settlements all over the earth is inevitable and does not imply true overpopulation to the extent that it occupies "new territories," eliminating jungle, desert, or all open space.)

The final five chapters (of 16 in all) may be of somewhat less general interest, being devoted to the practice of medicine, which nevertheless has its own fascination for the practicioners and for their clients, who are all of us. I shall only list the chapter titles: "Hippocrates in modern dress"; "Man meets his environment"; "Eradication versus control"; "The control of disease"; and "Medicine adapting."

This is an altogether fine book, one that cannot fail to interest any intelligent reader.

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Levant Geology

M. A. Avnimelech has been associated with the Department of Geology of the Hebrew University of Jerusalem since 1930. He prepared this volume, **Bibliography of Levant Geology: Including Cyprus, Hatay, Israel, Jordania, Lebanon, Sinai, and Syria** (Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 204 pp., $6), a 22 by 27½ cm, double-column, offset-printed book to fill a void in bibliographic information. He plans to augment these data by supplements.

The introduction (pp. vii to x) contains a short synoptic history of geological research in the Levant countries. The book is divided into four parts: Bibliography (pp. 1 to 104), Chronological index (pp. 107 to 135), Analytical subject index (pp. 139 to 184), and List of quoted periodicals and serials (pp. 187 to 192). The frontispiece, an outline map, delimits the geographic scope. "Hatay," not labeled on this map, is that part of Turkey between the

northwestern corner of Syria and the Mediterranean Sea.

The bibliography contains 4500 references dating from "*ca.* 1250" through any, zoology, and archeology are in- 1963. Peripheral subjects such as botcluded. Original titles in European languages are retained; non-European titles are translated into English. The chronological index shows that publications increased progressively from the rate of five papers a year during the years from 1849 to 1865 to more than 120 a year during the time 1949 to 1963. The National Union Catalogue shows that 11 of the 19 references published prior to 1800 are available in the United States.

Avnimelech processed a wide group of publications, and retrieved references that are not readily available. In order to assess the coverage, I compared the 1962 references in the analytical subject index, listed under the Levant country headings, except Hatay and Israel, with those in the *Bibliography and Index of Geology Exclusive of North America* (Geological Society of America, 1964). The Levant bibliography includes 13 titles not listed in the G.S.A. bibliography, and omits two titles recorded in the latter.

This book is a valuable research tool for those interested in geological and peripheral disciplines of the Levant countries. Typographical errors are few.

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Developmental Psychology

Henry Maier's intentions in writing **Three Theories of Child Development** (Harper and Row, New York, 1965. 332 pp., $6.75) are to explicate and compare major orientations in the realm of child development. He does so with the hope that the presentation of these theories, together with their implications for current practice in the helping of children in their development, will generate new ideas, guide professional practices, and lead to new explorations in this area. The orientations of Erik H. Erikson, Jean Piaget, and Robert Sears are chosen from among others. A primary criterion leading to this decision was that these three approaches dealt with "personality development as a continuous and sequential process, starting with a child's status as an infant and dealing with each subsequent stage of psychological growth: early childhood, childhood, and adolescence. Moreover, theories to be selected had to supplement one another to provide a composite explanation or description of human personality development" (p. 6). These theories were contrasted with most, which were characterized as concerned with man as a virtually completed product. The perspectives are seen to supplement one another in that Erikson is viewed as focusing primarily on emotional development, Piaget on cognitive development, and Sears on behavioral development.

Separate chapters are devoted to the somewhat informal explication of the primary substance of each of the orientations. After these presentations, the author, who has a primary concern with child guidance, outlines what he sees to be the fundamentals in the helping process. The "helping process" is defined as "A process of socially engineered intervention in which the practitioner deliberately introduces into the experience of an individual specifically structured means of preventing or treating deviant development" (p. 207). The helping process is subdivided into (i) study processes, (ii) appraisal processes, and (iii) treatment processes. The three theoretical orientations are then compared, with the result that they are found to be primarily congruent. A primary congruence is argued for their treatment of similar developmental phases. The loose complementarity established in this chapter is then interpreted in terms of its implications for the helping relationship.

Developmental psychology, like its superordinate subject matter, psychology, needs theoretical integration. Although this volume perhaps does not attain the rigor of Hall and Lindzey's *Theories of Personality*, let alone that of a volume like *Modern Learning Theory*, by William Estes and others, it is informative and has value as a step in the right direction.

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On the Perceptual Worlds of Philosophers and Scientists

It is the intention of the author, Rom Harré, in this essay, **Matter and Method** (Macmillan, London, 1964; St. Martin's Press, New York, 1965. 135 pp., $3.25), to show the importance of the "general conceptual scheme" in the development of natural science, and to illustrate this by the discussions of the nature of matter and its relation to the perceptual world by 17th-century philosophers and scientists.

Harré begins by distinguishing two sorts of scientific theories. Reticular theories, the first type, consist of "a set of relationships between refined observational concepts, mediated by one or more theoretical concepts which are to be understood wholly in terms of a complex of the refined observational concepts of the theory" (p. 13). In contrast to this, there are explanatory theories in which a set of generalizations stated in terms of essentially observable features of the physical world are explained by the assumption that there are some theoretical entities and some relations among them which are, in turn, so related to the observables that changes assumed to occur among the theoretical entities can be said to explain the regular changes among the observables.

Harré emphasizes that in explanatory theories there are two quite different connections or links between the theoretical and the observables. One is the *causal* link (when a theoretical concept refers to an event that causes an observable event); the other is the *modal* link (where a theoretical concept and an observable concept express two aspects of the same "phenomenon"). In the case of *causal* links, Harré states that cause here must mean more than regular sequence—that is, it must mean generation or production. His argument is as follows: "We cannot observe a concomitance between the phenomena posited by the theory and the phenomenon observed, since, at least in the initial period of a thing's history, the former cannot be observed." This argument does not convince me for the following reason: we must distinguish between (i) the *meaning* of causal connection in the regular sequence theory, and (ii) the *evidence* for causal connection in the regular sequence theory. If this is done (even though the earlier adherents of the sequence theory of causal connection may have made something of a mess of this), the regular sequence theorist is surely at as much liberty to posit sequences that are unobserv-