

problem. Among currently held hypotheses the alternatives that they were primary magmas or that they were derivatives of an alkali ultramafic parent ascending from the mantle find repeated expression in both books. The publication of the books at this time should stimulate continuing research on the challenging genetic problems these rocks present. *The Geology of Carbonatites* with its straightforward, systematic treatment of the subject will doubtless appeal more especially to the student, while *Carbonatites*, as a symposium study, is likely to find particular favor with the specialists. All students of the subject should have ready access to both volumes.

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## Endocrine Tissue

**The Adrenal Cortex.** ALBERT B. EISENSTEIN, Ed. Little, Brown, Boston, 1967. 701 pp., illus. \$22.50.

It is some time since a comprehensive examination of the status of knowledge of the adrenal cortex has been published. This new text is highly informative while, in most chapters, appropriately indicative of the large deficiencies in present knowledge. As Gregory Pincus notes in the foreword, four major fields are dealt with: (i) the nature and control of corticosteroid biogenesis and metabolism; (ii) corticosteroid secretion and transport; (iii) the biological action of the adrenocorticosteroids and synthetic analogues; and (iv) clinical investigation of adrenocortical function in health and disease. There are 26 contributors, and the level of presentation ranges from highly specialized analysis and viewpoint of interest to the physiological and biochemical investigator to practical guidelines for the clinician.

It is not quite clear how long the book was in the press but it seems to have been rather a long time. Despite undoubted efforts of the authors to be up to date at zero time, there are some topics in which the scene has already shifted significantly. As for scope, the editorial net was cast wide, but, although one does not envy the editor his problems of selection, perhaps not wide enough. There is an interesting section on electron microscopy, but, as

the preface notes, there are no chapters on anatomy and histology; thus the volume might be usefully considered as a companion to *The Adrenal Cortical Hormones* (Springer-Verlag, Berlin, 1962), which has extensive coverage of histology by Deane. However, a chapter on adrenal androgens was an evident omission at this point in time. In turn this may have led to the lack of exposition of contemporary thinking and theory on steroid dynamics, particularly in relation to peripherally interconverting compounds which have their origin in the adrenal cortex. The biosynthesis of the adrenal androgens is covered, and their role in the adrenogenital syndrome is well presented. Yates's discussion of feedback in cortisol control is very interesting.

Since the stated aim was a comprehensive coverage of current knowledge on the adrenal cortex, the reader with general biological as well as clinical interests will be aware that the overall orientation is weak in comparative physiology, notwithstanding a few chapters such as the one on biosynthesis. Similarly, a section on ecology, population dynamics, and the adrenal could have highlighted endocrine interrelations, a subject of rapidly growing interest. The editor has been tolerant of the differing emphasis in the chapters, which range from historical record with scholarly review to presentation, sometimes including new data, in which the authors' own researches are pivotal. The diversity makes for stimulating reading. Overall, the editor and authors have provided a valuable integration for all with endocrinological interests.

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## The Families of Mammals

**Recent Mammals of the World.** A Synopsis of Families. SYDNEY ANDERSON and J. KNOX JONES, JR., Eds. Ronald, New York, 1967. 461 pp., illus. \$12.50.

Our literature is replete with checklists and general monographic works on mammals, with field guides and manuals on the species of many states, and with treatises on orders and genera of Recent and fossil forms. Still lacking has been a comprehensive survey

of the intermediate taxonomic groups throughout the world. This need was recognized by graduate students in mammalogy. In 1950, a group of about 16 at the University of Michigan assembled extensive synoptic material on the families of mammals, together with distribution maps. Other groups with the same purpose, in 1953 and again in 1959, met at the University of Kansas; this book, sponsored by the American Society of Mammalogists, is an outgrowth of the materials they organized. The 18 contributors include nine of the participants in these meetings, among them the two editors who supervised the expansion and standardization of the copy and saw it through the press. Readers of Cockrum's *Introduction to Mammalogy* (also the Ronald Press, 1962) will note a similarity to this volume; the two had the same derivation, but the present work is far more complete and carefully prepared.

This book contains "a concise summary of each of the 20 orders and 122 families of living or recently extinct mammals." An introduction reviews the traits of mammals in general, comments on their distribution, and explains the organization employed in the book. The second chapter is a careful sketch of the fossil history of mammals. Thereafter, each chapter is devoted to one or more orders or parts thereof, with "information on form, function, distribution, numbers of species, and history." Written in telegraphic style, the book contains a vast amount of useful and often obscure information on structure, habits, habitat, and relationships. Listed are the subfamilies and their genera; some, of course, will quarrel over the inclusion or omission of certain ones. Considerable pains are taken (pp. 89, 102) to explain the relationships of the lipotyphlan and menotyphlan insectivores. At the other end of the scale, we read (p. 177) that "Men consider themselves important, both individually and collectively, and this has been reflected in an excessive number of names proposed for fossil hominoids, in an excessive volume of literature devoted to dubious interpretations and based on inadequate scraps of fossils or even less, and in an excess of emotional involvement in interpretations of evidence."

There are minor differences, mostly well established, from usage elsewhere—Didelphidae for Didelphiidae, Pteropodidae for Pteropidae, and Desmodontidae for Desmodidae, for example. The cetaceans are split into three orders,

Archaeoceti, Odontoceti, and Mysticeti (though not on p. 35); Pholidota and Edentata are used instead of Nomarthra and Xenarthra; the Pinnipedia are treated as a full order; Hyracidae replaces the familiar Procaviidae. For the most part (though not invariably) this usage follows that of Simpson (1945). Such changes are properly documented and discussed briefly where pertinent.

This is a convenient compilation of material from many scattered sources. There are here no keys for identification, no lists of species, no figures of skulls or teeth. With one exception (a graph showing numbers of fossil and Recent genera) the 70 figures are maps

depicting the world distribution of families. There is a bibliography of over 700 sources cited, and an index to the common names of many groups and the technical names of all genera and higher categories. The volume is well printed and nicely bound but, considered merely as a product of the bookmaking art, it is overpriced. It should prove an invaluable reference for students of mammals and should be very helpful to specialists in many other disciplines as well.

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## The Indirect but Constant Process of Innovation

**Technology and Change.** The New Heraclitus. DONALD A. SCHON. Delacorte Press, New York, 1967. 270 pp., illus. \$7.95.

In the compass of slightly over 200 pages Schon has attempted to write two books, one a philosophical tract for our times, the other a manual for R & D innovation in the American corporation. Since Schon is only an amateur philosopher but a professional research consultant (he has done stints with Arthur D. Little, Inc., the office of Technical Services of the Department of Commerce, and the Institute of Applied Technology of the National Bureau of Standards, and is now head of OSTI [Organization for Social and Technical Innovation], a research and consulting firm), it is not surprising that his discussion of the workings of innovation within an organization is more illuminating than his social philosophizing. Yet there is a great deal of merit in both elements of his book.

Seven-eighths of the book is devoted to the processes of invention and innovation. Invention Schon defines as "the process of bringing new technology into being, or again, the new technology created in the process"; innovation is "the process of bringing invention into use." Our rational view of invention as a series of orderly steps intelligently directed toward an objective spelled out in advance is both oversimplified and false, he points out. In actual experience, invention occurs as a nonrational process building on unexpected phenomena, and "once a process of technical development has begun, it does not usually move in a

*straight line, according to plan, but takes unexpected twists and turns."* Schon similarly destroys the rational view of innovation as a manageable process, like other functions of the firm, in which risks are controlled by the mechanisms of justification and review. Nevertheless there is utility in acting *as if* the rational view of the process of invention and of innovation were correct. It allows for planning, which is useful, provided it is done in a flexible way, with the plan treated as "something from which to deviate" in response to new requirements and new discoveries.

Attitudes toward technological innovation in American industry today are contradictory and complicated, Schon explains. Most corporation executives say in public that American industry must engage in product innovation simply in order to keep up with competition; but, Schon holds, many corporations actually resist innovation. For the corporation is a society in microcosm, and societies resist attempts to change their value systems and operations. Because innovation threatens the corporate hierarchy, disrupts the established technology, and, most important, imposes on corporate society a "confrontation with uncertainty," the corporation either rejects it outright or isolates it from the rest of the corporation, pursues a policy of containment, or attempts to convert it to an activity which can be carried on without disrupting effects.

It is not surprising, therefore, that the principal source of major technical change in mature industry is innovation by invasion, that is, the flow

of technology from one industry to another. Certain American industries—Schon uses textiles, machine tools, and building, 1930–1960, as his examples—have remained traditional until new R & D-based industries (particularly chemical, electronics, and aerospace) have invaded and thereby changed them. But how does major technological innovation occur in the industries that invade the tradition-bound industries? Schon points out that these industries are science-based (their R & D function is an integral part of the firms, not an appendage to other functions), their capital resources are considerable (in many cases they have federal support), and they have established a style of research-oriented entrepreneurial activity. These factors enable them to overcome the resistance to technological innovation and to invade other industries with new technology.

What should the role of the federal government be in matters of technical innovation? Since the government cannot affect entrepreneurial activity within individual firms, its contributions must be indirect. It can provide models of innovation; it can encourage mobility on the part of labor, adjustment on the part of companies, and assistance to depressed areas in the development of new industries based on new technology; and above all it, and especially the President, can set the "tone" for innovation by replacing the prevailing mutual distrust between industry and government with a climate of trust.

Schon gives us no specific ways in which this atmosphere of mutual trust can be developed, nor any particular measures which the government might take to encourage technical innovation; he does, however, suggest what the government ought to do to prevent traditional industry and industrial patterns from interfering with technical innovation. In this connection, it is perhaps illuminating to compare Schon's general recommendations with the specific recommendations for government policy contained in the recent RAND Corporation and Brookings Institution study, *Technology, Economic Growth, and Public Policy*, by Richard R. Nelson, Merton J. Peck, and Edward D. Kalachek. These authors' specific recommendations for government action to promote technical innovation would not, I suspect, lead to the atmosphere of trust which Schon "ranks highest on the list of