

The expedition was of sufficient duration that, in spite of uncomfortable weather and extremely difficult terrain, Marion Island, at least, was investigated and studied in detail. Prince Edward was only visited relatively briefly. The book is evidence that afterward the investigators were able to devote the necessary time to working up their results to a point of definitive conclusions. It is an expedition report in the grand tradition, and it is published in a style appropriate to the enterprise.

Van Zinderen Bakker, leader of the expedition, in his introduction summarizes the history and geography of the islands and the results of the expedition, as well as the place of these islands in relation to the other islands of the subantarctic zone.

Climate, volcanology, vegetation, and birds, being among the most obvious and pervasive components of the island ecosystem, receive the most attention in the report, both in meticulous description and in interpretation. Palynological researches, the specialty of the leader, give a time dimension to the vegetation picture. A thorough study of the ecology of the birds and seals shows how their activities and excretory products mold the vegetation in certain areas. All of this, against the background of the geological and climatological investigations, yields an "in depth," functional description of this ecosystem that should be a model for such studies. The inherent simplicity of the system relative to most others of comparable size, of course, made this possible within the time and manpower limitations of the study. The last half of the book is composed largely of thorough and meticulous systematic studies that give a solid biological basis for the ecology and biogeography that are the permeating themes of the work.

Abundant tabular presentations make the data readily accessible and easily separable from the interpretation. A number of small sketch maps and diagrams are provided, as well as fine volcanological and topographic maps folded in a pocket at the end, and the abundant superb photographs bring the whole system visually to life for the reader. Best of all, the South African government in 1947-1948 declared these almost completely undisturbed islands a strict nature reserve and is maintaining them as such.

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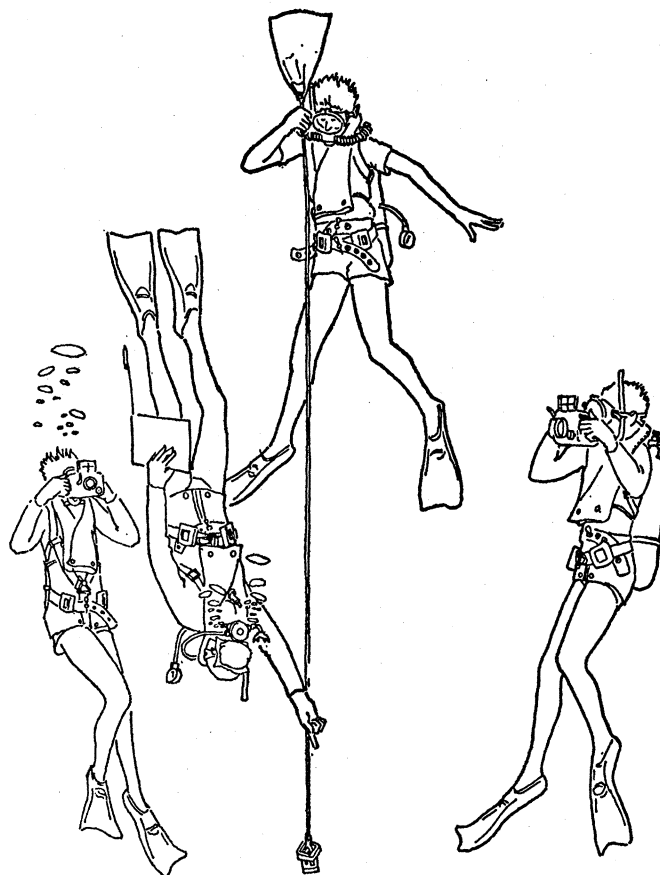
Scientific Diving

Underwater Science. An Introduction to Experiments by Divers. J. D. WOODS and J. N. LYTHGOE, Eds. Oxford University Press, New York, 1971. xiv, 330 pp., illus. \$13.

We have here the first book-length treatment known to this reviewer of the broad aspects of scientific underwater work. Approximately one-tenth of its some 300 pages deals with general techniques and equipment, one-third with the psychological and physiological responses of the diver, and the remainder with examples of methods and results drawn from geological, biological, archeological, and physical oceanographic studies. Though exotic gas mixtures, closed-circuit and hardhat diving, underwater habitats, and deep submersibles are touched on, the vast majority of the material pertains to diving using

the standard equipment available within the budgets and abilities of most diving scientists, air tanks and open-circuit regulators.

Some 25 years have now passed since such equipment became available to scientists. The question then is not the purpose of this book's parturition, but rather why it has been so long in gestation. In the United States, and I suspect in Europe as well, the acceptance of diving as a legitimate scientific technique has come slowly. Perhaps the major reason for this is that early scientific diving was practiced mainly by students, and the results were primarily anecdotal and extremely hard to verify. (What major professor wants a student whose shoulder he can't look over now and then?) This book indicates the coming of age of scientific diving. The students are now the professors, and it must seem inconceivable



A study designed to test knowledge of the vertical under water. "One diver holds a plumb-line (out of sight of the subject) to indicate the vertical in the photographs. The subject turns a somersault, and then attempts to orientate himself to the vertical, pointing upwards or downwards. When he is in position, two photographs are taken simultaneously from the side and rear. For some trials the subject wears a black-out or semi-transparent screen over the face-mask. The order of the trials is written on a Formica board, carried by the subject." To complete the study "the angular deviation from the vertical was measured from the photographs, and the true (or maximum) deviation was calculated from the apparent deviations along the two lines of sight. The mean deviations for five divers of moderate experience ranged from 8° to 33°, depending upon the experimental condition." [From *Underwater Science*]

to them that anyone would attempt the study of underwater phenomena without utilizing an element of in situ observation.

The early generation will not profit greatly from this book. Workers long engaged in underwater studies have already learned their lessons the hard way: performance even in clear, warm, shallow water is at least an order of magnitude more difficult than that in the laboratory and degrades as the log of the depth; keep the equipment simple and negatively buoyant (lest it fall up); document with photography; plan judiciously. But they should certainly scan the bibliographies accompanying the nine chapters. The authors are all British, and their illustrative material naturally draws heavily on work done by members of English institutions. Some of these citations could easily have been overlooked by workers in the United States.

The book should prove most valuable to those considering or just beginning scientific studies involving diving or divers' performance, and it could serve well as a text or supplemental reading for scientific diving courses. Certainly administrators at institutions where diving is done under their cognizance will learn much, as will non-diving researchers and military leaders, who frequently have asked the impossible from divers and experimental subjects. There are many good leads for the designers of diving equipment. Finally, a better understanding of the underwater environment will be gained by all readers.

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Trouble-Making Terrains

Karst. J. N. JENNINGS. M.I.T. Press, Cambridge, Mass., 1971. xviii, 254 pp., illus. \$8.95. Introduction to Systematic Geomorphology, vol. 7.

Karst. Important Karst Regions of the Northern Hemisphere. M. HERAK and V. T. STRINGFIELD, Eds. Elsevier, New York, 1972. xiv, 552 pp., illus. \$35.

Regions of the countryside underlain by carbonates, gypsum, and other soluble rocks develop a characteristic suite of surface and subsurface landforms

collectively known as "karst." Karst research in the United States has always been a rather minor effort, but the new significance attached to environmental geomorphology in the past several years has shown that karst terrains above all others present a unique set of environmental problems. Highways collapse into sinkholes, building foundations subside, dams leak, water supplies are polluted, and the development of groundwater resources is hampered by the peculiar hydrology of a mature karst. In spite of the great reawakening of interest in carbonate hydrology and geomorphology, there has been nowhere an interested student could turn for a summary of the present state of knowledge. However, this situation is rapidly being corrected, and to the writer's knowledge there are a half dozen books on karst somewhere in the pipeline. The two reviewed here are the first to appear in print.

Jennings has written a textbook for topical reading at the senior or graduate level. It is the seventh of the series of volumes on landform studies. Modern geomorphology emphasizes processes: rivers, winds, waves, snow and ice, and chemical attack by solution. Karst landscapes result from strong chemical attack by surface, soil, and groundwater on rocks of specific lithologies with strong guidance by structural elements. Solutional sculpturing of the landscape differs from other geomorphic processes in that in addition to a characteristic set of landforms—sinkholes, dry valleys, bold residual hills, and a variety of small etching and sculpturing of the bedrock surface—there is also a corresponding set of underground structures: caves of many shapes and descriptions, underground streams, and deep vertical shafts. They are all here: the description of the landforms, the processes that formed them (although the book is a bit thin on chemistry, considering that karstification is mainly a chemical process), the role of structure, the role of climate, and the way in which karst areas have evolved through time. Jennings is widely traveled, and his examples flit lightly from Australia to the Adriatic, to the United States, to Britain, and back to Australia, all within the same paragraph. The book is a delight to read and should serve its purpose as an introductory text very well.

Herak and Stringfield's book is an attempt to provide a monographic de-

scription of the important karst regions of the Northern Hemisphere. The book was conceived through the working group on carbonate terrains of the International Hydrologic Decade, and the chapter authors are mainly Europeans. The European chapters describe the karst areas of Yugoslavia, Italy, France, Germany, Austria, Czechoslovakia, Poland, Romania, Great Britain, and the U.S.S.R. Each chapter follows more or less the same format: an overview of the distributions of karst areas within the country, a summary of the geology of each, and then a major discussion of karst landforms, hydrology, and in some cases the special problems, such as the perennial flooding of the farmlands in the poljes of Yugoslavia, that arise in each.

In terms of the authors' expressed desire to describe the "important karst regions of the Northern Hemisphere" the book falls considerably short of the mark. Even within Europe, the arctic karst of Norway, particularly Lapland and Spitzbergen, and the arid karst of Greece, Iran, the circum-Mediterranean countries and North Africa are conspicuous by their absence. Asia is represented only by the eastern U.S.S.R. Some of the world's classic tropical karst occurs in South China and North Vietnam. These pass without mention, as do those islands of Oceania north of the equator. North America fares little better. There is a chapter on the tropical cockpit karst of Jamaica. The United States gets roughly 40 pages with emphasis on the Appalachians, the Atlantic coastal plain, and the interior lowlands, mainly southern Indiana and Kentucky. The most exciting field studies of karst terrains in North America during the past decade have been carried out in Canada and Mexico, and these go entirely unnoticed.

The authors, of course, had set themselves an impossible task. What we karst zealots would like to have seen would have been a ten-volume work, rather than a single book. For the areas covered, this book provides an invaluable overview of the geological problems, in some cases the only one available in English, and an extensive bibliography to guide one into the literature.

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