are also proving to be a powerful tool by delineating the sub-bottom strata with "x-ray vision." Their impact is just now being felt.

In the past Shepard believed that submarine canyons were cut by rivers at the greatly lowered sea levels that resulted from the lockup of water in continental glaciers many times the size usually accepted by Pleistocene geologists. But over the past two decades he has gradually revised this opinion. Shepard and Dill now come to no firm conclusion except to offer that river cutting (in the upper reaches), turbidity currents, various ordinary currents, and mass movements are all important. They question the "extreme confidence placed by so many geologists in turbidity currents as the major or only cause of submarine canyon excavation." They also doubt the reality of the high-velocity turbidity current (up to 55 knots) whose existence has been inferred from cable breaks. The overall results of their synthesis are to de-emphasize the role of turbidity currents, further to de-emphasize the role of river cutting, and to emphasize mass movements. They also suggest that submarine canyons have been cut throughout all geologic time and not only during the Pleistocene while sea levels were lowered, although some intensification of cutting may have occurred then because of an increased supply of sediment. They finally note that much work lies ahead before most of the answers on the origin of submarine canyons will be forthcoming.

ROBERT S. DIETZ
Institute for Oceanography, Environmental Science Services Administration, Silver Spring, Maryland

Dormancy

In **Spores, Their Dormancy and Germination** (Harper and Row, New York, 1966. 368 pp., illus. $14) Alfred S. Sussman and Harlyn O. Halvorson have succeeded in their aim of producing a monograph "largely restricted to discussions of dormancy in microbial systems in which biochemical aspects have been analyzed in some detail." Investigators and graduate students will find the volume a handy source of references and a welcome up-to-date résumé of current information strongly reinforced by the generous use of illustrations and tabulations of data from numerous sources. Typographic errors are few, the printing handsome, and the index adequate.

Spores of fungi and, to a lesser extent, spores of other plants are considered, but to an overwhelming extent the book deals with bacterial endospores. This emphasis is attributed to the relatively greater focus of activity in the last decade by biochemists, electron microscopists, and enthusiasts of exobiology on studies of bacterial endospores. Yet this very concentration of interest prevents the volume from representing the thoughtful analysis and general statement of the dormant state in biology that one might have hoped for.

CARL LAMANNA
Office of the Chief of Research and Development, Department of the Army, Washington, D.C.

Peptides

The recent synthesis of insulin by peptide chemists in China, Germany, and the United States represents a high point in the application of an art whose development began with Fischer and Curtius at the beginning of this century. In retrospect, it is clear that the major contribution during the intervening years was the introduction, by Bergmann and Zervas in 1932, of the benzyloxycarbonyl group to protect the amino group of an amino acid while its carboxyl group is being activated for reaction to form a new peptide bond. When, after 1945, important new methods were devised for the activation of carboxyl groups in such reactions and several new protecting groups were added, the stage was set for the laboratory synthesis of complex peptides; these later developments received powerful stimulus from the recognition that many natural substances having pharmacological or antibacterial activity are peptides of moderate size and complexity. In 1953, duVigneaud and his associates proved by synthesis the cyclic nonapeptide structure they had proposed for the hormone oxytocin. By 1963, the available methods permitted the synthesis by Schwyzer of the 39-amino-acid chain of the adrenocorticotropic hormone. Now the hope of many peptide chemists is to apply their art to the unequivocal laboratory synthesis of proteins larger than insulin—in particular, enzymes. The first steps in this direction have recently been taken by Hofmann, who has made the amino-terminal 20-amino-acid sequence of pancreatic ribonuclease. Not only is synthesis important in the proof of a structure deduced from degradative studies; it provides the most reliable known means of modifying structure in a systematic manner, and thus represents the surest road to the understanding of the structural basis of biological function. A potentially valuable by-product of such work is the creation of variants of a natural peptide that are more effective than the parent compound in medical practice.

In **Peptide Synthesis** [Interscience (Wiley), New York, 1966. 304 pp., illus. $9.50], Miklos Bodanszky and Miguel A. Ondetti have provided the best available brief introduction to the present state of the art. After three short introductory chapters, the succeeding sections deal concisely but clearly with protecting groups, the formation of the peptide bond, racemization, the strategy and tactics of peptide synthesis, and the synthesis of biologically active peptides. The authors have been selective in their treatment, and the text is easy to read. The bibliographical citations are numerous, but carefully chosen from the very large literature on the subject. The book is highly recommended to graduate students and to research workers seeking an authoritative review of the problems of peptide synthesis.

Among the peptides found in nature, or derived from proteins by partial proteolysis, is a group of compounds that exert a pharmacological effect in lowering the blood pressure of mammals. Among them are bradykinin, kallidin, kallikrein, gastrin, eledoisin, physalaemin, and substance P. In October 1965, an international symposium was held in Florence, Italy to discuss the chemistry and pharmacology of these substances, and **Hypotensive Peptides** (Springer-Verlag, New York, 1966. 686 pp., illus. $18.60), edited by Ervin G. Erdös, Nathan Back, Federigo Sicuteri, and Anne F. Wilde, gives the proceedings in full. There are over 60 separate scientific contributions, and the 130 or so participants include nearly all the active investigators in the area under discussion. The volume provides an extremely useful source of information about the recent advances in this field.

JOSEPH S. FRUTON
Yale University, New Haven, Connecticut