ticulatory musculature and showing reduced articulation of specific word patterns. He produces evidence to demonstrate that patterned electromyographic activity, as well as generalized heightened tension, occurs in such activities as problem solving. However, more sophisticated techniques would be necessary, and are indeed only now becoming available, for detailed reading of the pattern of individual words.

Sokolov describes an interesting series of experiments which show that the amount of articulatory activity in problem solving will depend on the nature of the problem (with more activity for problems with obvious verbal content) and its difficulty. He believes also that there are substantial individual differences in the use of articulatory processing. His experiments with "interference" show the same pattern of the effects of task difficulty. In addition he is able to show interesting interactions between the target and the interfering task. Simple repetition of a single syllable presumably keeps the motor side of the articulatory mechanisms as busy as more complex performance. The effects are not as destructive, however, as recitation of more complex memorized material. Sokolov discusses the meaning of this in connection with his hypotheses about the function of inner speech.

Two general points of view are possible about the function of inner speech. One is that the electromyographic indicators simply represent some kind of overflow phenomenon—they are interesting and useful simply as manifestations of activity at some higher level, and give hints of the possible content. A second possibility, which Sokolov supports, is that the presence of activity in the articulators stimulates sensory activity from the articulators and that this serves a function per se in problem-solving activity. It might conceivably be possible to differentiate these points of view by experimental interference with sensory feedback.

This book is interesting more for the inspiration it offers for future research than for the work is describes. The electromyography of speech is now a rapidly developing field. Sokolov's book is rich in suggestions as to how it might be used as a probe in studying the more elusive areas of problem solving, reading, and short-term memory.

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Psychoneuroendocrinology

Influence of Hormones on the Nervous System. Proceedings of a meeting, Brooklyn, N.Y., June 1970. D. H. FORD, Ed. Karger, Basel, 1971 (U.S. distributor, Phiebig, White Plains, N.Y.). xx, 504 pp., illus. $31.45.

Endocrine secretions play an important role in modulating various aspects of neural function underlying behavior and mood. In turn, psychological factors, such as anxiety, affect pituitary hormone secretion. In recognition of this interplay, a group of scientists representing various basic and clinical disciplines have organized an International Society of Psychoneuroendocrinology. The papers in this book were compiled from the first meeting of this society.

Because of the breadth of the growing field of neuroendocrinology, it is not surprising that this single volume is not truly representative of the various topics which comprise the field. Nevertheless, the 40 chapters give important and interesting insights into several of the more active areas of investigation. A large number of the chapters deal with the role of thyroid hormone in the development and function of the brain. These papers describe a multitude of effects on brain chemistry, physiology, and behavior which result, either directly or indirectly, from thyroid hormone excess or insufficiency. However, very little is known about the basic cellular mechanism of thyroid hormone action, except from the work described by Sokoloff and Roberts concerning a thyroxine-induced mitochondrial factor which stimulates amino acid incorporation in immature brain and immature and adult liver. Other papers provide support for the direct action of thyroxine and certain steroid hormones on the brain by showing that systemically administered radioactive hormones are taken up into nervous tissue. At the cellular level, Chader and Villee examine the binding of estradiol to brain cell nuclei, deVellis and co-workers show that glial cells are targets of adrenal steroid action, and Pfaff and co-workers examine the neurophysiological consequences of testosterone and corticosterone action on the brain.

Neural regulation of endocrine secretion receives limited coverage. Krieger and Krieger examine the effect of putative neurotransmitters, intracerebrally administered, on ACTH secretion, and Kawakami and co-workers examine the role of various limbic structures in modulating ACTH secretion. Papers by Donovan and by Clemens and Shaar examine the neural regulation of gonadotrophin secretion. Steroid hormone effects on behavior and mental performance in mature animals are described by Klaiber and co-workers, by Michael, by Ciaccio and Lisk, and by Dupont and co-workers.

One of the most intriguing topics in this volume is the role of steroid hormones in the ontogeny of sexual behavior and neuroendocrine regulation. Nadler describes the masculinizing effects of intrahypothalamic testosterone implants in baby rats, and Swanson describes the consequences of systemic administration of androgen in newborn hamsters on subsequent reproductive physiology and sexual behavior. Peretz and co-workers extend this type of work on rodents to the rhesus monkey, showing effects of perinatal androgen in determining the gender of threat and play behavior.

The relationships of such psychoneuroendocrine studies to clinical observations on man are dealt with in papers by Abrams, Brambilla and Penati, and the late Max Reiss. The book is dedicated to Reiss.

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Odontology

Dental Morphology and Evolution. A symposium, Englefield Green, England, Sept. 1968. ALBERT A. DAHLBERG, Ed. University of Chicago Press, Chicago, 1971. x, 350 pp., illus. $18.50.

The results of the first international symposium on dental morphology were published in 1967 as Vol. 46, No. 5, pp. 769–992, of the *Journal of Dental Research*. The organization of the second symposium, held in 1968, was largely the work of Percy Butler. The papers given, now available in book form, are divided into three basic but somewhat arbitrary and overlapping groups: Ontogeny, five papers; Phylogeny, six papers; and Morphology, another six papers. Most of these contributions deal with the teeth of primates (notably man) and primitive therians, with only occasional forays into other mammalian orders. I found the book to be rather uneven but instructive reading; I recommend it as a valuable reference work.

The section on ontogeny leads off

with the most readable paper in the volume, by Butler, devoted to explaining the growth of human tooth germs and the developmental sequence of cusps. He concludes that tooth growth is additive, not exponential as had been assumed earlier, even by himself in 1967. Tooth growth and calcification seem to be independent processes and growth between cusps continues until their calcified caps unite. One very interesting feature from a phylogenetic viewpoint is that in man the entoconid remains separate later than other lower tooth cusps do, so that talonid width increases by entoconid movement away from the other cusps until calcification ends growth. The captions of figures 3 and 4 of Butler's paper are in the correct sequence, but the drawings are unfortunately switched.

Three of the papers in the ontogeny section deal with dental histology and problems of induction, two of them describing ingenious experimental work. These three papers seem to me to come to somewhat contradictory conclusions, unless I was misled by differences in terminology. I would have preferred that their authors had combined their efforts into a single, integrated essay.

The section on phylogeny contains an instructive introduction to the phylogeny of calcified tissues by D. F. G. Poole, which points out many unsolved problems. A. Boyde shows wonderful scanning electron microscope pictures of mammalian enamel histology, but makes no sense of the peculiar distribution among mammalian orders of the features seen. P. Hershkovitz's paper, "Basic crown patterns and cusp homologies of mammalian teeth," is proclaimed in the anonymously authored introduction to the volume as a classic in its field; certainly I agree that all researchers concerned with dental cusp homologies will have to deal with it in future work. Hershkovitz goes well beyond Vandebroek and Quinet in finding it necessary to replace long-used names of dental features with unfamiliar new ones, and carries serial homology and supposed homology between upper and lower tooth cusps to their logical extremes, assuming certain premises. Readers will want to analyze for themselves whether zalambdodonty (in modern mammals) is primitive, as Hershkovitz would have it, or derived, whether metacones arise in the ways claimed, and whether Hershkovitz has actually demonstrated serial homology in each claimed case. The paper is totally lacking in functional interpretation, but an alphabetical list of 338 generally unfamiliar dental element names is brought together and the terms are defined according to Hershkovitz's interpretations. W. D. Turnbull's contribution consists chiefly of figuring the Field Museum's Trinity (Albian Cretaceous) mammal teeth by means of stereophotos. He also proposes several new and (I think) unnecessary higher taxonomic categories and develops an argument that it is premature to "force the Trinity therians into the metatherian-eutherian dichotomy." A potboiler by W. A. Clemens on Mesozoic mammals and a review by E. L. Simons of Old World anthropoid specimens from the Oligocene and Miocene complete the phylogeny section.

The morphology section contains two papers that I found especially interesting: I. Kovacs on just about anything one would want to know about dental roots, and K. Hiiemae and A. W. Crompton on a cinefluorographic study of feeding in the American opossum. The other papers are primarily about small-scale evolutionary changes within the genus *Homo*.

The book is well illustrated and supplied with both an author and a subject index. Unfortunately, there are a number of typographical errors.

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Deformation

Microtectonics along the Western Edge of the Blue Ridge, Maryland and Virginia. ERNST CLOOS. Johns Hopkins Press, Baltimore, 1972. xiv, 234 pp., illus., + maps. $12.50.

In one way or another the origin of deformed rocks is the subject matter of the long-standing field of structural geology, so it is perhaps remarkable that the state of strain of rocks is, with few exceptions, not well established. Though some workers have studied deformed fossils, the most straightforward way of determining strain has been to measure the orientation and shape of originally spherical or nearly spherical particles which were transformed into ellipsoids during deformation. Cloos did just this in his now-classic 1947 paper on the South Mountain fold between the Susquehanna and Potomac rivers, in which he described the deformation of originally nearly spherical calcium carbonate sand grains (ooids) within limestone beds of this 10-to-20-kilometer-wide fold.

The present monograph is an elaborate sequel in which the study has been extended far south along the Blue Ridge to Lexington, Virginia, and has been expanded to include a number of other deformation features. The careful reader who has the patience for the difficult and exasperating style, which would only warm the heart of Gertrude Stein, will find numerous subtle and rewarding insights into the systematic regional deformation of this 15,000-square-kilometer region of the Appalachian fold belt as well as into the variety and complexity of the operative strain mechanisms. The 85 high-quality photographs of deformation features are worth studying.

It is unusual in present-day earth science that a paper retains considerable importance after a quarter of a century. The continued influence of Cloos's works is due in part to the unpopular nature of this type of research. An enormous amount of labor is required to make the quantitative measurements that lead to qualitative insights. Since Cloos's original publication only a handful of workers, mostly German, have pursued this course. So a quarter of a century later Cloos has produced another careful study of Blue Ridge deformation which is destined to become a classic if for no other reason than that it is not likely to be repeated in the near future in other regions: 42,-585 ellipsoid axial ratios were measured on samples in the lab and over 25,000 field measurements were made.

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Clean Metal Surfaces

Chemisorption and Reactions on Metallic Films. J. R. ANDERSON, Ed. Academic Press, New York, 1971. In two volumes. Vol. 1, xii, 556 pp., illus. $32. Vol. 2, xii, 324 pp., illus. $21.

Studies of clean metal surfaces principally involve use of evaporated films, sections cut from single crystals, or the single crystal points of emission microscopy. Typical total surface areas of the samples employed are 100 cm^2, 1 cm^2, and 10^{-10} cm^2 respectively. The use of evaporated metal films suffers from the