sules, blood vessels, heart, liver, kidneys, gonads, myosepta, ova, epidermal glands, and pigments.

Špinar has clearly demonstrated that palaeobatrachids are related to pipids. Such derived character states as flooring of the Eustachian tube by the pterygoid, structure of the middle ear, tadpole, and elongated metapodials confirm this, and there are many suggestions of relationship to *Xenopus*, most primitive of living pipids. That palaeobatrachids form a distinct family is indicated by possession of uniformly procoelous vertebrae and a unique synsacrum incorporating at least three vertebrae.

In the area of higher classification Spinar's views are likely to differ from those held by some workers on anuran systematics (although it must be said that this is not an area in which agreement is common). While agreeing that pipids and palaeobatrachids are closely related, he believes that the latter are also related to the ancestry of "higher" (nonascaphoid) frogs. The character states indicating this are listed on his page 33; most of these are primitive, some overlap with pipids, and the functional significance of others is not well established. Špinar regards the presence of procoelous vertebrae in palaeobatrachids as particularly significant. In light of the developmental origin of procoelous and opisthocoelous vertebrae, many workers will not find this particular argument persuasive, nor will all be able to accept isolation of paleobatrachids in their own suborder in light of their close resemblance to pipids.

Špinar has attempted to substantiate his systematic views with a detailed analysis that deserves careful scrutiny. He has clearly perceived the pipid relationships of palaeobatrachids; that his ultimate phylogeny has (in my view) been overly influenced by particular character states does not detract from the superlative value of his monograph. In spite of the widespread interest in frog systematics, there are few living frog families that have been monographed with the care and detail offered in this case. This book is not to be viewed entirely as a specialized monograph; any vertebrate biologist concerned with amphibians will need it and it is a necessary resource for institutional collections.

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Russian Neuroscience

Vertebrate Memory. Characteristics and Origin. I. S. BERITASHVILI. Translated from the Russian edition (Tbilisi, 1968) by John S. Barlow. Plenum Press, New York, 1971. xiv, 144 pp., illus. $12.50.

This stimulating monograph by Beritashvili (Beritoff) offers certain unique approaches to the study of the brain mechanisms of memory that Western researchers might well find of considerable value. It is an interdisciplinary account, as Beritoff emphasizes the behavioral and anatomical basis of memory and also touches on its physiology and chemistry.

Beritoff distinguishes three forms of memory: image memory, emotional memory, and conditioned-reflex memory. These are reasonable conceptual distinctions which can be operationally defined by the different training situations in which each memory form is demonstrated. There is a tendency, particularly in recent work on the substrate of memory, to use the conditioned-reflex form of training but not to consider the possible contributions of emotional and image memory. The former, indeed, is usually viewed as a confounding variable. In such experiments, the so-called stress control subject is probably an animal that has been trained predominantly to have an emotional memory. The concept of image memory, it should be noted, is rarely used in the interpretation of experiments dealing with the neural substrates of memory.

Whether or not one agrees with this analysis, Beritoff's conceptual framework provides the reader with a perspective on problems related to the analysis of memory. It should be noted also that such conceptual skeletons in our own closet as "images" and "emotion" have been in recent years the subject of study by experimental psychologists in this country. Perhaps Beritoff's "subjective" terminology, then, will not even grate on the psyche of the modern behaviorist.

The monograph provides another new perspective which I found particularly interesting, all the more so perhaps because it arises from such a traditional approach. I refer to the section on the phylogeny of memory, in which Beritoff describes the degree to which each form of memory is present in the vertebrate series. This research suggests some fruitful naturalistic approaches to memory. For example, Beritoff notes that, in what in this country is called a one-trial passive avoidance task, fish cannot remember an aversive shock for more than 10 to 12 seconds. Might it be possible to construct a phylogenetic, or at least comparative consolidation, time dependency? What would be the neural substrates of these behavioral facts? Beritoff also provides a discussion of the ontogenetic and clinical approaches to the study of memory.

The reader will see no hard data, to which many of us are accustomed. Behavioral results are described qualitatively and no graphs or statistics are presented. This may leave certain scientists wary, but I think their inclusion would have changed the character of this book, detracting from the essential conceptual points.

We may be grateful to the translator, John Barlow, for a superb text, readable, clear, and concise. The book represents a distillation of Beritoff's 50 years of research at Tbilisi University. We are indeed fortunate to have this essential monograph now readily available, perhaps to relieve, in some measure, our provincial and sometimes narrow outlook on the study of memory.

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Books Received

Advances in Organic Chemistry. Methods and Results. Vol. 8. Edward C. Taylor, Ed. Wiley-Interscience, New York, 1972. x, 460 pp., illus. $18.50.

Africa. A Study in Tropical Development. L. Dudley Stamp and W. T. W. Morgan. Wiley, New York, ed. 3, 1972. xiv, 520 pp., illus. $14.95.

Aide-Mémoire de Détermination Bactérienne. R. G. Capet. Vigot, Paris, 1970. 136 pp. Paper, 38 F.

Analytical Methods for Pesticides and Plant Growth Regulators. Vol. 6, Gas Chromatographic Analysis. Gunter Zweig and Joseph Sherma. Academic Press, New York, 1972. xxviii, 766 pp., illus. $35.

The Anesthesiologist and the Surgeon. Partners in the Operating Room. John P. Bunker. Little Brown, Boston, 1972. xxii, 158 pp. $8.95.

ANOVA 45. A Flexible Computer Program for the Analysis of Variance. Instructions for Use. Roger J. Weldon and Alan B. Humphrey. University of Arizona Press, Tucson, 1972. x, 70 pp., illus. Spiral bound, $6.95.