lems in treating the chemical arts as an integral and independent branch of effective knowledge. The result is a view of chemistry as an abstract system comprising coherent categories, divisions, and definitions, divorced from its applications and so organized that it provides a foundation for pedagogic techniques.

This is a good book. It enhances the historian's art, and it deserves readership. Here is another sign that history of science is reaching its majority.

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Marine Chemistry

Analytical Methods in Oceanography. Papers from a symposium, Atlantic City, N.J., Sept. 1974. THOMAS R. P. GIBB, JR., Ed. American Chemical Society, Washington, D.C., 1975. x, 238 pp., illus. $26.50. Advances in Chemistry Series, 147.

The editor of this book gives its purpose as "to acquaint land-locked chemists with the accomplishments and problems of marine chemists so that the accomplishments will be more widely honored and the problem solving shared." The book is not, he further says, "designed to inform sea-going chemists of recent advances by shore-based chemists." Gibb has assembled contributions from an interesting group of researchers that nicely accomplish the stated goals as applied to the study of trace metals and, to a lesser extent, to the study of nonbiological organic material.

Hume briefly describes the chemical nature of the oceans and the variety of unique problems encountered in work at sea. The next eight chapters discuss trace metal work. The three on sampling problems and techniques all point up the low concentrations encountered and the severe problem of contamination associated with sampling and processing in the oceans. Two chapters discuss the techniques for concentrating trace metals, a procedure that is generally necessary because of the low levels encountered in the oceans. Three chapters cover the analytical techniques: two on flameless atomic absorption and one on anodic stripping voltammetry. These eight chapters will be indispensable reading for anyone contemplating doing any trace metal work in seawater.

The other chapters of the book that will be of particular interest to chemists pertain to studies of hydrocarbons in the oceans. A well-rounded status report on the techniques used and the concentrations of the hydrocarbons in the oceans is given in three chapters. The techniques range from simple gas chromatography to computer-coupled gas chromatography and mass spectroscopy. Wangersky gives an enlightening summary of organic carbon analysis in seawater, with attention to the pitfalls.

Two chapters on studies of radioactive material in seawater give the concentrations of the radioactive substances encountered as well as details of techniques used. Livingston, Mann, and Bowen cover the transuranic elements and Silker discusses beryllium, zirconium, ruthenium, cerium, thallium, radium, and thorium.

The book falls short of completeness in that it fails to present methods for determining major constituents, nutrients, and man-made organic and inorganic pollutants. On the whole it can be especially recommended to scientists having an interest in the trace metals and hydrocarbons in the oceans.

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Primate Studies

Phylogeny of the Primates. A Multidisciplinary Approach. Proceedings of a symposium, Burg Wartenstein, Austria, July 1974. W. PATRICK LUCKETT and FREDERICK S. SZALAY, Eds. Plenum, New York, 1975. xiv, 484 pp., illus. $39.50.

The authors of the 17 papers collected in this book review various kinds of evidence used to draw inferences about the phylogeny of primates, ranging from the structure of fossil teeth to the structure of DNA molecules, from anatomy to behavior. The articles I found most stimulating were those by M. Cartmill (for approaches to interpreting morphology), F. Szalay (for new information on fossil prosimians), and M. McKenna (for new ideas on early mammalian evolution).

Cartmill analyzes morphological evidence of the lemuriform-lorisiform dichotomy and the phylogenetic relationships of cheirogaleids. On the basis of differences in cranial anatomy, lemuriform prosimians (Malagasy lemurs, indris, and aye-ayes) have long been considered a distinct group from the lorisiforms (lorises, pottos, and galagos, found in Asia and Africa), and cheirogaleids (mouse and dwarf lemurs) until recently were classified as a subfamily of the Lemuridae. However, recent reassessment of old information has suggested that cheirogaleids are actually more closely related to lorisiforms. How does one weigh the evidence? Cartmill demonstrates that the unusual "anterior carotid" artery found in lorisiforms and cheirogaleids is not a neomorph, but rather an enlarged ascending pharyngeal artery, a vessel found in most placental mammals. Why did it replace the internal carotid stapedial and promontory branches, seen in other prosimians, as a major pathway for blood to the brain? The presence of a rete mirabile on the ascending pharyngeal artery in lorisiforms leads Cartmill to suggest that it serves a thermoregulatory function, allowing short bursts of intense activity to raise body temperature without triggering the hypothalamus to initiate heat-dissipating, but dehydrating, panting reactions. The absence of that rete mirabile in the tiny cheirogaleid *Microcebus* must be explained, and Cartmill invokes allometry, suggesting that in such a small animal mere contact between the ascending pharyngeal artery and nasopharyngeal veins would be enough to cool cerebrum-bound blood. One way of testing that hypothesis, suggested by Cartmill, is to find out if a rete mirabile is present in the larger relatives of *Microcebus*, or lacking in the smallest lorisiforms.

One of the traditional diagnostic characters of lemuriforms is the presence of a tympanic ring suspended "free" within the auditory bulla, rather than forming part of its lateral wall (as in lorisiforms). Cartmill argues that the main difference is not a "free" ring (the ring is attached to the bulla by the sometimes ossified annulus membrane), but rather that the tympanic cavity has expanded laterally beneath the tympanic ring in lemuriforms. That perspective allows new interpretations of early fossil primate ear regions. Cartmill notes that at least some plesiadapiforms (*Plesiadapis*) and tarsiiforms (*Necrolemur*) share with early lemuriforms (*Adapis*, *Notharctus*) the subtympanic expansion of the middle ear cavity seen in modern lemuriforms, which thus appears to be the primitive condition. Ontogenetic studies show that the lorisiform condition occurs as a stage in the development of the lemuriform middle ear (it can be seen in newborn lemurs), and therefore would be easy to retain into adulthood. From allometric considerations of middle ear morphology, Cartmill suggests that the lorisiform ear region would be expected in any lemuriform lineages undergoing reduction in body size. (That hypothesis can be tested by examining allometric relationships