and instrumentation theory and practice to enable him to build, operate, and understand such electronic instrumentation as is necessary for his research. This book is probably the best single answer available to the demand for a do-it-yourself guide to biophysical instrumentation. In addition, it is, for the expert, a fine compendium of know-how and references, and it contains succinct résumés of specialized techniques and mathematical developments of basic electrical and electronic theory at a level just sophisticated enough to take care of most needs without requiring the use of advanced mathematics.

The American reader will find three substantial shortcomings in the book, only one of which could possibly be charged against the author: it is written in British, not in American, English; it is too expensive for use as a textbook or as a book to be bought by the neophyte researcher for his personal bookshelf; and it stops 3 to 5 years back in several areas where electronic technology has been dashing forward.

The language problem is not trivial, for electronic jargon *is* substantially different in England and the United States, and a term often has very different meanings in the two countries. Both "static" and "dynamic" transducers, for example, are special types of "active" or "passive" transducers in our usage. Components and circuits have different names, for example, "tagboards" for "tiestrips," "concertina phase splitter" for "split-load phase inverter," "brimistors" for "surgistors," and so forth. These differences seem merely amusing when we understand them, but they are highly confusing when we do not. In addition, examples taken from commercial components are not always applicable to American products, nor is there always an equivalent product.

The neglected, recently-developed areas are particularly those having to do with solid-state devices and the logical circuitry and control-system devices which have arisen out of electronic computer advances and military-industrial control instrumentation. There is a last-minute chapter on transistors which is sound and pertinent, but it stops substantially behind the present state of the art. Masers, nuclear resonance and molecular resonance equipment, magnetic amplifiers, precision function potentiometers, core memories, storage tubes, modulation codes—none of these is more than barely mentioned. Printed circuits and modular construction have been severely neglected. Workhorse computer elements that are entering most up-to-date biological laboratories are conspicuously scarce. Hybrid vibrator-stabilized amplifiers, precision integrators and differentiators, adders, multipliers, rooters, curve tracers, digital-analog converters, direct digital read-outs, and print-outs should at least be mentioned.

Pointing out these shortcomings is, however, in effect praising the book with faint damns. The 280-page section on "Theory" is a splendid introduction or refresher on electronic theory. The 50-page section devoted to "Practice" (components and laboratory procedure) is good but differs substantially from American standards. The 252-page section on "Transducers, electrodes and indicators" covers its chosen material well but falls short of ideal choice of subject matter. Its treatment of microelectrode techniques is outstanding. The material on light sources, temperature and humidity control, and strain-gage transducers includes much material not readily available elsewhere. A final 126-page section on "Complete apparatus" discusses power supplies, bioamplifiers, some recording and timing devices, and it has an unusually appropriate section on interference control. The short chapters on trouble shooting and instrument design are too abbreviated to be of much use.

Over-all the book is undoubtedly the best and most complete source of information on electrical instrumentation currently available to the experimental biologist.

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**Encyclopaedia Zoologica Illustrated in Colours.** vol. 2. "Pisces" by Ichiro Tomiyama and Tokiharu Abe. "Prochordata" by Takashi Tokioka. Hokuryukan, Tokyo, Japan, 1958. 478 pp. Illus. $25.

The first volume of this popular series includes the mammals, birds, amphibians, and reptiles of Japan. Volume 2 illustrates the fishes and prochordates. Volume 2 is divided into three sections, of which the first two were written by Tomiyama and Abe. The first section covers 912 species of marine fishes, illustrated in color; for each, the common and scientific names, a brief description, maximum size, and distribution, are given; for fish of economic value, the texture of the flesh is given also. The second section, on aquarium fishes, covers 108 species, illustrated in color, and gives information of importance to an aquariist. The section on the Prochordata, by Tokioka, contains illustrations, in color and in black and white, of 135 species, and for each one the scientific and common names, a brief description, and size and distribution are given.

The fishes are carefully illustrated by the following artists: Yoshikichi Makino, Ketsunori Tateishi, Mitsuo Shirao, Tadanao Hayabuse, and Masaru Goto. The colored photographs were taken under the supervision of Tadashi Tomura.

This gorgeously illustrated volume was intended to be a popular account of the fishes and "prochordates" of Japan, and without doubt the authors have succeeded in fulfilling this intention. In general, this is a basically accurate work, with only a few instances of careless spelling of scientific names. We disagree, for only a small number of the species, with the scientific nomenclature used for the marine and aquarium fishes. The authors should be proud of this book.

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**Heredity and Evolution in Human Populations.** L. C. Dunn. Harvard University Press, Cambridge, Mass., 1959. 157 pp. $3.50.

This, the first of the "Harvard Books in Biology," sets a nice tone for a series of books designed for laymen. In his interesting preface, Dunn acknowledges that his writing is not colorful, saying that this is as it should be, that he prefers an accurate statement to a fine phrase. Having set the stage thus, the author proceeds to the essentials of genetics and evolutionary principles. The implications of the sickle-cell trait are well presented. The variation in the distribution of the blood-group genes is posed as a problem in selection that is yet to be solved. Dunn's study of the Jewish community in Rome is retold. Restraint marks the discussion of methods of consciously altering human gene frequencies. The only objectionable statement made is the one at the bottom of page 88 that implies that *gene* frequencies can be altered by prohibiting the marriage of cousins; in truth, only genotype (and phenotype) frequencies are affected by the mating system used.

Since this is the first of a new series, a suggestion may be in order regarding style. Dunn's book contains no bibliographic citations whatever. The thinking behind this is obvious. But is it not possible that the publishers have underestimated "the layman"? At this moment, grocery stores all over the country have on sale cartons of Coca-Cola in which there is a little leaflet discussing nutritional matters: the effect of sugar on teeth, the nutritional identity of "natural" and artificial sugar, and so forth.

The write-up concludes with some half dozen citations of original research papers, carefully chosen for quality and relevance. Now all this, you may say, is just "window dressing." How many food purchasers will ever check the references? Few indeed; but that is not the point. The fact that the men from Madison Avenue should use this gimmick implies a greater sophistication on the part of the soft-drink buyer than the editors of a university press will grant to the readers of Dunn's book, which is hardly likely ever to descend to a display rack beside the grocery checking counter. A book of this sort should not have an exhaustive listing of its sources, but a representative sample of the better reviews, monographs, and selected original papers would surely increase its impact on the class of reader to which its content appeals.

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**Anatomie de Latimeria Chalumnae.** vol. 1, *Squelette, Muscles et Formations de soutien.* 122 pp. (text) + 80 pp. (plates). J. Millot and J. Anthony. Publié avec le concours de L'Institut de Recherche Scientifique de Madagascar, Tananarive, par les Éditions du centre National de la Recherche Scientifique, Paris, 1958.

This sumptuous volume on the skeleton and musculature of the coelacanth *Latimeria chalumnae* is the first of a series by Millot and Anthony on the anatomy of this unique and venerable fish. Ten adult and subadult specimens, including three females, are available for this investigation, which is being carried out at the laboratory of comparative anatomy of the Muséum National d'Histoire Naturelle, Paris.

The details of the skeleton, which are of particular interest to paleontologists, confirm in a striking manner the amazing conservation of this system, which, in most respects, has remained unchanged in the coelacanths since the late Devonian. The partly cartilaginous braincase, divided into separate ethmosphenoid and otico-occipital segments, is nearly identical with the completely ossified neurocranium of the Devonian coelacanths. There is limited motion between the segments, which are held together by ligaments, and ventrally by powerful subcephalic muscles. These muscles work in opposition to the coracomandibularis muscles which elevate the anterior segment through the intervention of the palatoquadrate.

There is also a close and unquestionably significant resemblance to the well ossified rhipidistian braincase, but with two important modifications. First, the ethmosphenoid moiety in *Latimeria* contains a large median rostral cavity which has three openings on each side to the exterior and contains an organ of unknown function. It now seems probable that this cavity was present in all fossil coelacanths but was absent in the rhipidistians. There is also a median nasal sinus, regarded by the authors as a vestige of an embryonic internasal cavity. Second, the intracranial articulation in the coelacanths is modified by the development of an antotic process, followed, in the Carboniferous, by the loss of the basipterygoid process. Although it is not specifically stated, it appears that the maxillary and mandibular branches of the trigeminus in *Latimeria* emerge at the intracranial fissure, instead of within the otico-occipital segment as in the rhipidistians. Also, the foramen for the profundus nerve is in front of the antotic process. These changes are associated with a basic difference in the jaw mechanism in coelacanths and rhipidistians, but as Romer pointed out, they do not necessarily mean that there is a fundamental difference in the location of the intracranial joint in the two groups.

Tertiary coelacanths are unknown, and the Mesozoic ancestry of *Latimeria* cannot at present be ascertained. The dermal skull pattern, particularly in the snout region, is suggestive of certain Triassic genera rather than the known Jurassic or Cretaceous forms. The reduction in the ossification of the cheek elements and in the supraorbital series also occurred in several Triassic genera, but this may well be a case of parallelism.

The anatomy of the visceral skeleton elucidates a number of points which have not been clarified in the fossil forms. The hyomandibular, previously known in one Devonian genus, has a large canal for the hyomandibular vein and the mandibular and hyoid branches of the facial nerve. This was presumably the situation in most rhipidistians, although in one (*Eusthenopteron*) the hyoid branch was wrapped around the lateral surface of the hyomandibular. The peculiar articulation of the symplectic with the mandible well behind the typical quadrate-articular articulation is known only in *Latimeria,* but it may have existed in the extinct genera as well. There are five branchial arches, presumably the number in the rhipidistians, covered, as in *Eusthenopteron,* with dental plates.

The notochord is a fibroelastic tube, extending anteriorly through the notochordal canal of the otico-occipital segment to the posterior face of the basisphenoid. Cartilaginous "basidorsals" and "basiventrals" are situated above and below the notochord. The neural spines only are ossified. Ribs are absent. The notochord was undoubtedly persistent in all coelacanths back to the Devonian, and there is no suggestion of a perichordal chondrification or ossification. By contrast, all known rhipidistians had perichordal ossification, foreshadowing the condition in tetrapods.

The fins are typical in all respects, with the characteristic "lobed" condition in the paired appendages, as well as in the second dorsal and the anal fins. One point of particular interest is that the ball-and-socket joint between the girdles and their corresponding fin skeleton is the opposite of the rhipidistian-tetrapod condition. In *Latimeria,* the head is on the endoskeleton of the girdle, and the socket is on the proximal element of the fin skeleton. The exoskeletal part of the girdle is not attached to the skull, and the supracleithrum is absent. The internal skeleton of the paired fins differs mainly from that of the rhipidistians in the reduction of the proximal preaxial radials. The pectoral fin has well-differentiated adductor and abductor muscles and deeper, numerous pronators and supinators which enable the fin to rotate about 180 degrees. The pelvic musculature has a similar but somewhat less complicated arrangement. Consideration of the implications of this pattern in relation to the transition from fin to limb will be greatly aided by a description of the innervation, which will presumably be included in the next volume.

In a rather involved concluding statement, Millot and Anthony discuss the possible meaning of certain features found in *Latimeria.* They agree with Romer (for crossopterygians in general) that the persistent notochord and the subdivided braincase are neotenic characters, and they add to these the high proportion of cartilage in the braincase of the post-Devonian coelacanths. In seeking an explanation for the remarkably small brain volume of *Latimeria* in relation to the volume of the cranial cavity (about 1/100) and for the greatly extended stalk of the pituitary, they apparently reject the possibility of allometric growth (for which there is no present evidence) in favor of this being the primitive condition. They attribute the large size of the pedunculated fins to hypertely, related to an increase in body size. In my opinion, a satisfactory explanation for the amazingly small brain of *Latimeria* has not yet been found, while the size of the pedunculated fins may be related both to body size and to function.

There are many details in the skeleton and musculature which cannot be considered here that are of interest from