This observation is at once applicable to the steam in radiator pipes. Most text-books in physics give the following explanation: "The sharp rattling noise in steam pipes is due to the water hammer. A column of condensed water is driven along the pipe by the steam, the cooler steam ahead of the column condenses, and the column of water hammers against the end of the pipe or against a stationary body of water in the pipe." This description of the phenomenon is correct as far as it goes, but it fails to emphasize the fact that for the sharp clicks the whole mass of water vapor between the two surfaces of water (that is, the bubble) *condenses into water instantaneously.*

The observations upon the bubbles in the cryophorus were made by my assistant, Mr. Lee Fullmer, who also differentiated the sharp clicks in the steam-pipes from the duller thud of the water hammer.

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SCIENTIFIC OBSCURITY

SINCE it has been my lot for many years to earn my living by translating scientific literature into the vulgar tongue, I have often wondered why the writers made it such hard work to read the original language.

If the difficulty were due to the profundity of the thought or complexity of the reasoning, then it could not be avoided. But I have found that important papers by the deepest thinkers were apt to be easier to follow than those by minor men dealing with comparatively trivial topics.

Nor does the cause of the obscurity lie, as is commonly said, in the use of technical terms. The sports section or fashion page of a newspaper has as specialized a vocabulary as a scientific paper. Many scientists do indeed employ technical language unnecessarily in writing for the outside public, but even where the words are all familiar the meaning may still be obscure.

I have come to the conclusion that the chief reason why scientific literature offers such high resistance to reading is the use of the alternating current instead of the direct in conveying the thought. The writer interposes a negative every few words that reverses the meaning of the sentence. This keeps the reader on the jump.

The asymptotic ideal toward which scientific writing tends is a sentence structure something like this:

> The present writer is indisposed to deny that he is unconvinced of the necessity of refusing to accept the infrequency of negative reactions as a not insuperable argument in disproof of the theory.

Such sentences may be quite logical and free from technical terms. They can be disentangled in time and when straightened out the meaning may turn out to be something simpler than it sounds. But they are constructed like the Chinese boxes, when you get one opened you come on to another. The process of extracting the meaning is like the simplification of a complicated algebraic equation, and in extricating the internested parentheses you are likely to come out with the plus and minus signs mixed.

In conclusion, the present writer is indisposed to deny that he put the wrong title at the top of the letter. It should be, not "Scientific Obscurity" but "Unscientific Obscurity in Writing on Scientific Subjects."

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SCIENTIFIC BOOKS

Birds of the Pacific States. By RALPH HOFFMANN. Boston, Houghton Mifflin Co., xix + 1–353 pp., with 10 color plates, and over 200 black and white illustrations, by Major Allan Brooks. 1927.

THE diversity of native animal and plant life in the Pacific states has long been a source of attraction for students of biology, but beginning acquaintance with the fauna and flora has heretofore been hampered by the lack of suitable manuals. This need is now in process of being satisfied, as during the past three years there have appeared four important keys which will help to unlock the doors leading to accurate knowledge of the western biota. Jepson's "Manual of the Flowering Plants of California" is the first statewide botanical key for California; Essig's "Insects of western North America" is the very first comprehensive western volume in entomology; Johnson and Snook's "Seashore Animals of the Pacific Coast" is the pioneer volume in the popularizing of western marine biology; and Hoffmann's "Birds of the Pacific States," while preceded by other volumes dealing with birds, easily stands premier as a manual for field ornithology in the west.

Most bird students are interested in the living bird, and in the early stages of their interest they are concerned chiefly with the problem of identification in the field. Despite this obvious fact, a majority of the bird books heretofore issued have ignored or given but minor attention to this phase of the subject. Mr. Hoffmann was, and still is, a pioneer in the production of workable field manuals. In 1904 there appeared his "Guide to the Birds of New England and eastern New York" which dealt with "over two hundred and fifty species with particular reference to their appearance in the field." For the novice this volume is still the best field book of birds for the area

indicated. The present contribution treats of more than four hundred western species from the standpoint of their field appearance and behavior.

"Birds of the Pacific States" is a compact volume (one and one-eighth by five and three-eighths by seven and five-eighths inches) substantially bound in green buckram, and hence suited for actual field use. The style is terse, an element of the contract which produced a volume useful from Vancouver Island to San Diego and from the Pacific Ocean to the Great Basin. The appearance, voice and movements of the bird, its habitat preference and the ways in which it may be differentiated from other species of similar appearance constitute the principal parts of the text of the species chapters. The plumage, geographic range and nesting habits are set forth briefly, following the paragraphs dealing with identification. The *species* is (with one or two exceptions) the unit of consideration; subspecies are listed with their respective ranges but without reference to their characters. The book follows the "new" or revised classification and sequence which will be used in the forthcoming Fourth Edition of the American Ornithologists' Union check-list and which American bird students will soon be forced to learn.

The illustrations merit special mention. All are by Allan Brooks and all are *new*. There are ten plates in color, showing in all forty-seven species. In several instances both males and females are figured. The plates are not quite right in this impression; either the etching or inking is slightly in error, giving too much red in several figures, a fault which can be corrected in future printings. The black-and-white illustrations are from pen-and-ink sketches, a medium seldom used heretofore by Brooks, but one which he has handled exceedingly well. Differences in color are indicated by different types of line treatment so that the student obtains a very good idea of the distribution of color masses on the bird. Here again some of the figures are of groups of two or three species or exhibit differences in plumage due to sex or season so that, in all, upwards of 60 per cent. of the species are shown either in color or line. The reviewer is of the impression that, in general, black and white illustrations are better than color for the beginning student, although the novice will probably believe the contrary to be true. The element of conservation in identification is involved here, an item which also is stressed by our author.

Among the thousands of items of record in the volume under discussion a few—a very few—catch the eye as errors or omissions. The iris of the barn owl is dark, not yellow (p. 161), the pileated woodpecker resides in the Coast Ranges from Lake and Mendocino counties northward as well as in the Sierra Nevada (p. 193), the breeding range of the robin scarcely includes the Sierran foothills (p. 259) but begins with the yellow pine forest; it also nests at various places in the Coast Ranges and locally in the lowlands of California. The ecologic preferences of certain species are even more restricted than indicated. The Bell sparrow (p. 326) is a bird of the greasewood (*Adenostoma*) chaparral, the rufous-crowned sparrow (p. 327) chiefly of the "old-man" sage (*Adenostoma californica*). It would have been helpful to indicate (for the beginner) the meaning of the few abbreviations used, and dimensions for nests and eggs would have aided in field identification of accessories.

This volume is built upon the principle that the habits of birds are, in general, so stable that we can predict their behavior and can use behavior as a means of field identification. This point, although well known to critical teachers of ornithology, has not found adequate expression heretofore in field manuals. The habits of birds are specific characters no less than the details of skeletal structure, soft parts and feather architecture. Mr. Hoffmann has written his book largely upon this basis and has produced a "comparative field ornithology" or a "manual of comparative behavior of birds" which we can rank with our manuals of comparative anatomy.

The quality of the present volume rests, among other things, upon the author's energetic field work; during his seven years of residence on the Pacific coast he has succeeded in observing alive upwards of 95 per cent. of the species described. First-hand impressions, written on the spot, and, with many species, tested by repeated contact, are the firm foundation on which this outstanding manual is constructed.

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Textbook of Comparative Physiology. By CHARLES GARNER ROGERS. McGraw-Hill Co., N. Y., 1927.

ROGERS' book on comparative physiology of animals is the most comprehensive discussion in this neglected field that has yet appeared in a single volume in the English language. Emphasis in recent years on the teaching of physiology under pressure for direct training in subject-matter for immediate practical application in the arts of medicine and of agriculture has led to the extreme development of human and mammalian physiology to the exclusion of that degree of comparative training which we accept without question as necessary for cytology and for anatomy.

There are twenty-nine chapters on the subjects of properties of protoplasm, the cell, general phenomena of life, organ systems, the transport system, the blood as an oxygen carrier, catalytic actions of animals, and the more conventional topics on secretion, nutrition of animals, circulatory mechanisms, physiology