ment of psychology at the University of Dubuque, has been appointed professor of psychology and philosophy at the University of Arkansas.

DR. ASA A. SCHAEFFER, of Clark University, has been appointed professor of zoology at the University of Kansas.

R. C. RICHARDS, formerly of Trinity College, Cambridge, and fellow of the Institute of Physics, has been appointed Quain lecturer in physics at University College, London.

DR. HENRY BLUMBERG, professor of mathematics at the University of Illinois, is to be on leave of absence during the academic year 1924–25.

HERBERT A. ROGERS, research assistant professor at the University of Minnesota, will be associate professor of psychology at the University of Vermont next year.

DR. WALTER C. KRAATZ, now acting professor of zoology at Miami University, has been elected to the position of assistant professor of biology at the University of Akron.

DR. BRUCE HOUSTON has been appointed assistant professor of chemistry in the University of Oklahoma.

APPOINTMENTS at Brigham Young University have been made as follows: Dr. Milton Marshall, of the University of Chicago, assistant professor of physics; Dr. Carl F. Eyring, of the California Institute of Technology, dean of the college of arts and sciences, and L. John Nuttall, Jr., director of training schools at the university, dean of the college of education.

## DISCUSSION AND CORRESPONDENCE

### ON THE PROPER WORDING OF THE TITLES OF SCIENTIFIC PAPERS

WHEN Dr. H. H. Donaldson published, in SCIENCE for February 23, 1917, a note entitled "More complete titles," I was too inexperienced in bibliography to appreciate fully its meaning and value. In this note he specifically suggested that there be included the name of the animal, scientific or common or both, and some indication of the group to which it belonged. However, in June of that same year I began work on Volume III of Dr. Bashford Dean's "Bibliography of Fishes," and in 1919, by reason of the lamented death of the talented Dr. Charles R. Eastman, I became the active editor of that work. The marked feature of Volume III is its elaborate and minutely subdivided subject index, and in my part of this I had not gone very far when the incompleteness and misleading wording of a great number of the titles of ichthyological works became painfully apparent.

As our work here progressed, a series of articles bearing more or less directly upon the subject at hand was published in SCIENCE. In the issue for September 3, 1920, Mr. Neil M. Stevens, of the Bureau of Plant Industry, wrote on "The obligation of the investigator to the library." And in that of September 30 of the same year, Mr. Gordon S. Fulcher, of the Corning Glass Works, discussed "Scientific abstracting," as a great time-saver to the researcher.

More to our purpose, however, was the article of Miss Eunice R. Oberley, librarian of the Bureau of Plant Industry, on "Abstracts and titles of scientific articles from the librarian's standpoint," in SCIENCE for November 18, 1921. In this she made a strong plea for such clear and definite titles as will enable the librarian or bibliographer quickly and accurately to catalogue the article so that the investigator *must* find it in his search for the literature.

Next (SCIENCE, August 25, 1922) came the outstanding article by Mr. W. W. Bishop, formerly superintendent of the reading room of the Library of Congress and at present librarian of the University of Michigan, on "The record of science." In this Mr. Bishop made it very clear that "bibliography is the foundation of research." Later, this article was very effectively commented on by Mr. K. C. Walker in SCIENCE under date of October 13.

And lastly I spoke on the subject before the American Society of Zoologists at Cambridge on December 28, 1922, and published in its Proceedings in the *Anatomical Record* of January, 1923, a short abstract entitled "The proper wording of scientific titles."

These various articles would indicate that the matters of abstracting and bibliography, and the proper wording of titles on which they are vitally dependent, are very much in the minds of librarians and bibliographers. Furthermore, the botanists and zoologists are likewise becoming interested, for the Union of Biological Societies of America is even now considering the founding of an abstract and bibliographical journal.

Volume III of the "Bibliography of Fishes" is now done and has been distributed. The outstanding section of this volume is the Subject Index in which the 45,000 titles in Volumes I and II and in the Addenda in Volume III have been minutely analyzed and then brought together, likes with likes. This has been a prodigious undertaking, but we who have done it believe that we have produced the most efficient tool ever made for the use of ichthyologists, and for librarians and bibliographers seeking certain definite references in fish literature. This has been done at great cost of time, labor and money. The time has been increased by many months, the monetary cost by thousands of dollars, and the labor infinitely by defective

and misleading titles which had to be looked up before they could be properly and accurately located in the subject index. And now because of this hard experience, I am moved to discuss the subject which forms the heading of this article in the strong hope that thereby some authors and some editors may be led to the clarifying of titles to the great benefit of future bibliographers, librarians and researchers.

Scientific articles are written that they may be read, but the people who mage them available to readers are bibliographers and libranians, and their efforts are badly crippled by imperfect, misleading, faulty titles. Classification of these faulty titles is not easy, since in kind and degree of faultiness they intergrade, but in order to make clear their faults the following rough distribution will be used: I, indefinite; II, misleading; III, absurd. Of all these some "horrible examples" will now be considered.

First let us consider some titles which by their indefiniteness befog the inquirer's mind. "An unusual sea monster in the bay" might mean a whale, a crocodile, a giant squid, a great shark or any large tropical bony fish, like the sailfish, which attains a length of 12 or 15 feet, and the bay might be any one of a hundred bays. As a matter of fact the title should have read, "*Rhineodon typus,* the whale shark, in the Bay of Bengal." Again, "Notice of an extraordinary fish" might mean any one of a hundred fishes, whereas it refers to the occurrence of the whale shark in Manila Bay. Like these is "On a singular fish from the South Seas," which as a title is absolutely indefinite and practically meaningless. Such also is "Note sur un embryo monstreux." Is this monstrous embryo mammalian, avian, reptilian, amphibian, piscine or one of a possible thousand invertebrate forms? Scores of other utterly indefinite titles might be quoted, but one more will suffice. An old inaugural dissertation was entitled "De Monocerote," and one does not know whether it refers to the Arctic unicorn, to the swordfish or to the unicorn beetle. Another old writer used the same front title, but put in it in I-II-III-order the three unicorn beasts just referred to.

Under the head of misleading titles the following may be quoted: An author entitled his book "Ancient Angling Authors," and one would conclude that he dealt with all, but examination of his book shows that he confines himself to English writers only. Another very authoritative work bears title "Fishing from the Earliest Times," and one would presume that it brings the subject down to the present, whereas it concludes with 500 A. D. A monograph headed "Studies on Lepidosteus" (a Ganoid) is the most authoritative work on the egg-membranes of Teleosts. Another great monograph is entitled "On the Ovary of Selachii," but examination showed that it had to do with the development of the egg, its follicle, membranes, nucleus, yolk, etc. Another reads, "Notes on the Life History of Illinois Fishes," but examination showed *no* life histories at all but brought to light the best paper yet published on the *breeding habits* of the freshwater fishes of the central states of our republic.

Finally, there is a large series of very important papers by one of the leading authorities of the world bearing the title, "On the anatomy and classification of ——— fishes" or "On the osteology and classification of ——— fishes." When laboriously looked up the "anatomy" almost always turned out to be "osteology" and the "osteology" was generally that of the skull only. It would have been just as easy to have the title say *exactly* what these papers dealt with.

Now we come to the third class—titles which may be called absurd, but which, if the editor would permit, I would like to characterize by a stronger term. The first on my list reads "On Mene rhombeus." What is "Mene rhombeus"? The specific name sounds "fishy" but what is the "On"—anatomy, behavior, coloration, embryology, habits—*what?* Only a trip to the library will answer. The German aquarists are the worst offenders in using such titles, yet many of their papers bearing these titles contain admirable observations on habits. Titles of the absurd class might be given *ad libitum,* but only a few are listed—"On the Australian lamprey," "The mormyrid brain," "An electric ray and its young," "About the perch," "The basking shark," "*Ctenodus cristatus.*"

These are sample titles which will make clear some of the difficulties with which we have had to contend in working up the subject index of the "Bibliography of Fishes," and the compilation and publication of Volume III has been delayed for months by the handling of these "left-handed" titles. If such papers were by men of standing, if they were published in reputable journals, if their size indicated that they ought to contain valuable data they were laboriously looked up and properly carded for the index. But if they were short, were published in obscure journals, or were by little known men, they were thrown into "miscellaneous and general," and no further attention was paid to them.

It is really but little short of a crime against science for authors to put at the heads of their articles such faulty and misleading titles. If this is agreed to, then the editors of the journals in which such are published are certainly *participes criminis.* I have talked to a number of scientific men on the subject, but do not recall one who had ever had an editor object to or advise with him as to the wording of his titles. Surely the editors of our scientific journals could and should do all in their power to see to it that the titles of papers which they publish accurately indicate their contents, and thus enable these papers to be quickly and correctly catalogued.

How, then, should a title read so that a bibliographer may correctly classify its contents without having to look the paper up? First, the title should state definitely the subject under consideration—anatomy, embryology, habits, etc. Secondly, it should give both the scientific and the common names of the animal or plant (if it has a common name). The expert in that group of animals will, of course, recognize it by its scientific name, the worker on other animals will place it by its common name. And, thirdly, the group name should if possible be put in. For this the common names, fish, bird, insect, can generally be run in as a matter of course. I recall this title of a fine paper, "On the reactions of [the ghost crab] *Ocypoda arenaria.*" The words in brackets were not there and I was entirely at a loss to know what Ocypoda was. With the bracketed words inserted no one could possibly fail to locate at a glance the animal in its group.

Here follow some sample titles the like of which bring peace and not wrath to the troubled souls of bibliographers and librarians. "On the breeding habits and early development of the ganoid fish, *Lepidosteus osseus.*" "The structure of the skull in the gaff-topsail catfish, *Felichthys felis.*" "The development of the urinogenital system in the bonnet head shark, *Sphyrna tiburo.*" "The migrations of the common mackerel, *Scomber scombrus.*" "The method of locomotion in the climbing perch, *Anabas scandens.*" "The breeding habits of the fighting fish, *Betta pugnax.*"

It may not be as easy to make a good title as a bad one, but it can be done. Papers are written that they may be read; hence it will enhance the reputation of the writer if his titles are so clear that the bibliographer and the researcher must as a glance get the contents. And so, out of a hard and heart-breaking experience, as earnestly as I know how I wish to urge authors and editors to write such clear and definite titles as will make for the quick and accurate cataloguing and hence the ready accessibility of their papers. If so done, then by just so much will science be set forward.

E. W. GUDGER

THE AMERICAN MUSEUM OF NATURAL HISTORY

## THE RELATION BETWEEN VOLATILITY AND TOXICITY OF NICOTINE

RECENT studies of nicotine as an insecticide have shown that the toxicity curve of nicotine in solutions is almost an exact parallel of its volatility curve. The efficiency of this widely used insecticide may be so lowered by improper methods of handling that the value of the treatment is greatly impaired, or the lowered rate of toxicity is overcome by increasing the dosage used until the expense is almost prohibitive.

Levorotatory nicotine (free nicotine) is volatile and more toxic than the non-volatile dextrorotatory form (nicotine salts). Reduced efficiency then may result from two reasons: (a) the use of non-volatile nicotine salts, such as nicotine sulfate with insufficient alkali to free the alkaloid from the combining acid; (b) the volatilization or oxidation of nicotine from ground tobacco which is being used as a vermifuge.

The loss of nicotine from concentrated solutions of varying alkalinities was determined by evaporation tests with measured amounts of air at a constant temperature and as a dried film on leaf surfaces. The results from these tests were so uniform that only one will be given, namely, the foliage test. The determination of nicotine was made by the silicotungstic acid method. The solutions were all made with distilled water except as noted. The loss of nicotine in three hours was 51.5 per cent. from nicotine sulfate; 85.9 per cent. from free nicotine, and 89.6 per cent. from nicotine sulfate with sufficient alkali to neutralize the combining acid. Comparing these results with solutions made from tap water as in spray practice, we find a loss of 52.5 per cent. and where soap is added, at the rate of four pounds per hundred gallons, the loss was 63.4 per cent. The maximum volatility of nicotine was attained only by the addition of alkali, while in spray practice it is usually assumed that most waters are sufficiently alkaline, especially if soap is used, to free the nicotine and give the maximum efficiency.

Bioassays of dilute nicotine solutions, but with the same alkalinity as above, were made both by spraying and fumigation. The toxicity to aphids (*Aphis hederae* Kalt and *Rhopalosiphum persicae* Sulzer) ranged from 53.6 per cent. for nicotine sulfate in distilled water (pH 6.5) to 76.5 per cent. for nicotine sulfate solution with alkali to neutralize the combining acid (pH 8.2). Nicotine sulfate in tap water plus soap as above (pH 7.6) had an efficiency of 65.3 per cent.

Fumigation tests with those same solutions on aphids showed a range of efficiency from 48.1 per cent. for nicotine sulfate in distilled water (pH 6.5) to 88.4 per cent. for nicotine freed from the combining acid (pH 7.9).

The same correlation between volatility and toxicity was noted in dust mixtures. Kaolin, powdered vegetable matter and sulfur alone gave a very slow release of nicotine. The addition of 10 per cent. of alkali, such as hydrated lime or sodium carbonate, increased the rate of volatility materially, and correspondingly so the degree of toxicity. Sulfur in large proportions aided materially in increasing the efficiency of the dust mixture. The most effective were those containing 80 per cent. or more of sulfur with about 10 per cent. of alkali. Reducing the amount of