of research), and for sixteen years he carried the entire financial responsibility and editorial burden for the first thirty-three volumes, that is, until 1914, when Dr. Porter presented this journal (including back volumes in stock) as a gift to the American Physiological Society.

These are significant services to science and to our fellow men. They call for more than a passing note, as they echo and amplify the voice of the English chemist, James Smithson of a hundred years ago, whose vision of science, whose faith in man and whose material wealth established the Smithsonian Institution of Washington, *"for the increase and diffusion of knowledge among men."*

A. J. CARLSON
UNIVERSITY OF CHICAGO

PHILIP BARD
THE JOHNS HOPKINS UNIVERSITY

WALTER E. GARREY
VANDERBILT UNIVERSITY

F. W. WEYMOUTH
STANFORD UNIVERSITY

MAURICE B. VISSCHER
UNIVERSITY OF MINNESOTA

ENTOMOLOGY IN WAR-TORN CHINA

ENTOMOLOGY, along with other sciences, is suffering greatly in China under the pressures and privations of the war, which for China has lasted so long and been so hard. The war has not only destroyed so much in the way of university buildings, libraries, laboratory equipment, insect collections and the like, and forced the moving or repeated moving of nearly all the educational and research institutions of the country, but has almost completely closed the sources of supply of literature, equipment and materials from the outside world. The economic situation within the country, together with the restrictions of war, have totally prevented or greatly hampered the manufacture of equipment and the reprinting of books. Thus the student, teacher, research specialist, medical entomologist and agricultural extension worker have all had to attempt to pursue their work against almost insuperable odds.

Furthermore, American contributions to Chinese entomology have been in a way more hampered than the field as a whole. This is partly because some of the institutions in which Americans participate did not move to West China during the early part of the war before American entry. This was because they enjoyed some immunity from the Japanese, or found it convenient to move to, or remain in, places like the International Concession in Shanghai, or the British colony of Hong Kong, and resulted in their being caught with the coming of Pearl Harbor. Likewise, some of the American teachers who were in Free China have had to return home for health or other reasons, including the difficulty of adequate financing as a result of the extreme inflation in China.

The following excerpts from a recent letter from Professor B. A. Slocum, professor of entomology in the College of Agriculture of the University of Nanking, at Chengtu in Szechuan Province, can perhaps more graphically emphasize the grave situation of entomology in China to-day:

> Entomology is marking time right now, for we do not have funds for research work. We are having trouble even to secure funds for the research of our graduate students. . . . Our university is having to let 21 per cent. of our staff go this summer. We have cut everything to the bone. For example, I had only $5,000 Chinese currency [less than US$50.00, officially, or under US$20.00 on the black (open) market] for my whole division this past year. Right now we are trying to sell equipment to keep going. It is difficult to keep up the morale of the staff under such conditions. . . . My division is opening an insecticide laboratory this summer. One of my students who just received his M.S. minoring in industrial chemistry will have charge of it.

Letters from others indicate that most of the universities or scientific institutions are in the same state to a greater or lesser degree. Some have been cut off from the rest of Free China by the recent merger in Kwangsi of Japanese forces from Hunan and Kwangtung, and fear they may have to close or try to move again. Letters from some have urged that scientists in this country collect duplicate literature or equipment to send to China as soon as circumstances permit.

American aid to Chinese entomology (or other sciences) during this critical period can be of great value, not only in reviving and strengthening it and helping in the solution of many pressing problems, but it can also react with beneficial results in America. Chinese entomologists have contributed much to world entomology, and will do so much more in the future, and the making known of their pests, beneficial parasites and insecticides, and the solution of their problems in medical entomology, can be of great benefit to America as well as to the Orient. If this country can give literature, equipment and specimens, and arrange scholarships and exchange of students, professors and research specialists, those objectives can sooner be attained, with much mutual benefit, including progress towards an harmonious world society.

J. LINSLEY GRESSITT
DIVISION OF ENTOMOLOGY AND PARASITOLOGY,
UNIVERSITY OF CALIFORNIA, BERKELEY

THE THREAT TO PURE SCIENCE

THE article "The Threat to Pure Science" by Alexander Stern[1] raises a number of questions relative to

[1] A. W. Stern, SCIENCE, October 20, 1944.

the basic nature and function of science which, in my opinion, merit further discussion. The importance of such a discussion is underlined by the fact that many of Dr. Stern's views are shared in one form or another by a not inconsiderable group of research workers in many fields. I should therefore like to discuss several aspects of the problems posed by Dr. Stern.

The question of "pure" science versus "applied" science is a question which does not have real roots in life. Like the unicorn "pure" science is a myth. If by "pure" science is meant science unconnected with and not dependent upon any other phase of human activity, existing by, with and of itself, it is obvious that there has never been any such type of science.

If, on the other hand, by "pure" science is meant work that is done without regard for immediate practical applicability then it is obvious that what we are dealing with is an attitude on the part of the scientist doing the work rather than a basic characteristic of the work itself. This is so because all scientific work stems from work in a real world and therefore must have some applicability to the real world. The exact relationship of the work to practical affairs may at a given time be obscure, but the history of science is replete with examples of "pure" science that in time were of the greatest practical moment. Indeed, ironically enough, this is one of the chief justifications of those who carry the banner of "purism."

Let us discuss this attitude of disregard for practical applicability a little more deeply. By practical applicability we generally mean work that will help greater numbers of men lead richer, fuller, more comfortable lives. It seems most understandable that the majority of mankind will feel more in sympathy with those who would consciously contribute to the advancement of mankind than those who in effect say, "Mankind go hang. I am looking for intellectual stimulation and personal satisfaction."

The attitude of the "purists," as summed up by Dr. Stern, bears startling resemblance to the basic philosophy of those who play chess professionally. Chess is an absorbing game which has from the standpoint of number of conceivable moves infinite possibilities. To play chess well one must have the qualities which Dr. Stern considers necessary for great scientists, namely, "reason, detachment and understanding." And yet it is well known that chess is but a game; fascinating, it is true, but a game nevertheless, played by arbitrary man-made rules, and most great scientists, I am certain, would hesitate to spend a lifetime playing chess.

The chief difference between being a chess player and a scientist is, of course, that consciously or not the work of the scientist contributes to the advancement of mankind, and it is for this reason that being a scientist is generally regarded on a higher plane than playing chess.

I believe that it is a more proper attitude for a scientist to understand his relation to the world he lives in, to acknowledge his debt to all past science and human endeavor (without which his work would be impossible) and knowingly to contribute his work to the betterment of the present and the promise of the future rather than smugly to raise a false cry of "purity" or "intellectual satisfaction."

Sir Isaac Newton expressed somewhat the same thought when he said, "I stood on the shoulders of giants," as did John Donne when he wrote, "No man is an Iland, intire of it selfe; every man is a peece of the Continent, a part of the maine. ———— I am involved in Mankinde."

I should also like to discuss the question of "freedom of science" as posed by Dr. Stern and previously enunciated by Dr. Bridgman.[2] Some years ago Dr. Bridgman[3] called for the adoption of the operational analysis of physical concepts. By this he meant that each concept and question in modern physics required reduction to the specific operations in the real world giving rise to and defining the given concept. It is unfortunate that Dr. Bridgman did not extend his brilliant contribution toward solid thinking in physics to the question of "freedom of science." For by operational analysis it can be seen that science can never be independent of the society in which it exists.

Let us for example analyze the degree of freedom of science existing in the universities in free countries which is the desired, acceptable standard adopted by both Dr. Stern and Dr. Bridgman.

University research funds are paid for by either government subsidy or private endowment. Should the occasion arise when there would be an irreconcilable clash of policy between the object of the research and the endower of the research it is the research which would suffer. It is needless to say that these clashes do occur and that research does suffer.

Or let us look at the problem from another viewpoint. In 1932 and 1933 universities did not have much money to spend for research. So as a result thousands of would-be researchers did not fulfil their desires and much work of inestimable value was lost.

Is it not clear that the amount and kind of research depends partly on the economic and political level of a given society? The greatest threat that exists to science to-day is the possibility that we may not be able to build a politically and economically stable post-war world which will allow for the maximum expansion of facilities for research.

[2] P. W. Bridgman, SCIENCE, July 21, 1944.
[3] P. W. Bridgman, "The Logic of Modern Physics."

Further it may be seen that the question of whether this type or that type of organizational set-up for research is better can only be answered on the basis of a specific analysis of what the given organizational set-up would entail.

For example, to evaluate government supervision of research or corporation supervision of research one should determine the type of government, or corporation, the basic objectives of the supervision, who would be in charge of administering the supervision, what funds would be available for research, etc. Such an analysis when applied to universities reveals as many differences in degree of freedom as would be found in the case of governments or corporations. The chief point is that the most constructive attitude here is an open-minded scientific specific analysis rather than one based on general terms which have very few ramifications in actual practice.

EUGENE V. D. ROBIN

MAY I commend you, and Mr. Stern, for his communication on "The Threat to Pure Science" in your issue of October 20, 1944? It seems to me that the point he has raised is a crucial one. The emphasis in America has been on applied science and technology rather than on pure science, but is not all applied science the application to practical uses of the principles discovered in pure science? As Whitehead has well said, our utmost abstractions are the most powerful weapons with which we control concrete fact. The paradox consists in the circumstance that the greatest practicality can be obtained only if we pursue pure science quite independently of its practical usefulness. The fact that some pure sciences are indifferent to and even disdainful of application does not prevent their work being eventually highly useful. If, in America, we do not pursue pure science along with practical and applied science, we will not continue to make advances because we will not have any future pure science on which applications could draw, so from the narrow viewpoint of practicality, the detached pursuit of pure science is an absolute necessity.

Practical experience seems to bear this out, for in the absence of pure science on which the industrial laboratories could count, they themselves have been forced more and more to add theoretical researches to their programs. However, there is no reason why pure science should have to be conducted surreptitiously or expeditiously, for it can not under those circumstances do its best work. Things can not be properly related that are not sufficiently distinguished from each other. A pure science which pursued its course indifferent to the demands of society for usefulness would eventually prove the most useful investment that society could make, even though such an investment may have to be amortized over a period of years.

JAMES FEIBLEMAN

NEW ORLEANS, LA.

SCIENTIFIC BOOKS

A CATALOGUE OF VASCULAR PLANTS

Catalogue of the Vascular Plants of S. Tomé (with Principe and Annabon). By A. W. EXELL. xi + 428 pp. 26 figures. 3 maps. London: British Museum (Natural History).

FERNANDO PO, Principe, S. Tomé and Annabon form a group of small equatorial islands in the Gulf of Guinea close to the coast of West Africa. This catalogue is a model of what such a work should be. It is manifest that the author and his associates have made a serious attempt to account for all species previously credited to the islands covered, and at the same time have determined by a study of types and the early literature the proper status of many early names, some of which have been consistently misapplied since 1753. Adjustments in the application of widely used names in *Corchorus, Canavalia, Caesalpinia, Dichrocephala, Eclipta, Quamoclit, Ipomoea, Fimbristylis, Cyperus* and other genera for various pantropic species require that all individuals concerned with tropical floras consult this work if they are at all interested in the proper application of early published binomials. As examples, *Kyllinga pumila* Michx. becomes *Cyperus tenuifolius* (Steud.) Dandy, *Cyperus umbellatus* Benth. = *Mariscus umbellatus* Vahl becomes *Cyperus sublimis* (C. B. Clarke) Dandy, *Cyperus odoratus* Linn. stands for an entirely different species than that to which this name has long been erroneously applied, and what has long been miscalled *C. odoratus* becomes *Cyperus polystachyos* Rottb., and *Fimbristylis dichotoma* (Linn.) Vahl replaces *F. diphylla* (Retz.) Vahl and *F. annua* All., the Linnean name previously misapplied by most authors. The synonymy is critically assembled. Changes made in the names of various species are strictly in accord with the International Code of Botanical Nomenclature. The total number of species is not large, about 820 in all, including the introduced cultivated and naturalized ones. It is of interest to note that of these about 230, or about 28 per cent. also occur in the Philippines, separated from the Gulf of Guinea by the African continent, the Indian Ocean and the Malay Archipelago; about 50 of these are of