Book Reviews

Security, Loyalty, and Science. Walter Gellhorn. Ithaca, N. Y.: Cornell Univ. Press, 1950. 300 pp. $3.00.

It would be naïve to expect members of Congress to read this review, but, in the remote possibility that one of them may pick up this issue of SCIENCE and get to this page, I recommend the book for his consideration. As for the regular customers of this journal, Professor Gellhorn's contribution cannot be too strongly recommended to all those concerned not only with the state of science today but with the state of the Union. Some of the facts assembled in this book are so bizarre as to make every intelligent layman wonder that some scientists of force and originality still remain in government service. That they have done so is no fault of military intelligence or the House Committee *of* Un-American Activities. To what extent these two agencies have reduced our scientific advantage is, of course, difficult to determine.

It is said that, in order to avoid the unpleasantness resulting from the interruption of their research, a number of government scientists are seriously considering joining the Communist Party. They reason if they join "the Party" and then resign they become "ex-Communists," and practically everybody knows that to some public officials there is no one more loyal, more honorable, or more patriotic than an ex-Communist—except possibly an ex-Nazi. The idea may perhaps have something to recommend it but it won't work, for they'd still be scientists, and practically everybody knows that to some public officials there is no one more cunning, more treacherous, or more suspect than a scientist—except possibly a social scientist. So low a fellow is he that many states have seen fit to pass special laws concerning him and to require special oaths from him. These also apply to all his nonscientific academic associates, except college presidents. The latter, so I hear, can mingle with anyone and be free of guilt by association. One prexy has been heard to object to this type of class distinction (based on immunological criteria) on the grounds that it is very undemocratic and discriminates against college presidents. His name cannot be revealed for reasons of national security.

Another deterrent, so it is claimed, that keeps strong research men away from government laboratories is the overclassification of the work. This prevents the investigator from publishing—or, to be more correct —submitting for publication, the results of his research. Actually this is a boon to the editors of our more critical scientific journals. Nevertheless, the military and the AEC should avoid classifying as "secret" such data as are found in the first editions of *Kirkes' Physiology* (1848) and the *Handbook of Chemistry and Physics* (1914). Also, if they haven't got around to it yet, "Mothersill's" seasickness remedy should be removed from the "restricted" category.

Overclassification may also be hazardous to health. There is a rumor concerning a scientist who, while working in a military laboratory, wrote a report which was promptly classified as "secret." Now, he was only cleared to receive "confidential" material, and one day when he went to the laboratory's library to request a copy of his report, it was refused him as he was not cleared to receive "secret" material. This caused him no end of confusion and anxiety and he had to be placed in an asylum. Incidentally, he was a psychoanalyst. I am quite certain that all men of civilized feelings will agree that that is no way to treat an investigator, even a psychoanalyst.

And so those are some of the thoughts that come to mind while reading Professor Gellhorn's excellent and very serious survey of the sad situation of science and scientists, not only in our government laboratories, but also in many of our universities. That so important a book about so serious a situation should provoke in this reviewer whimsical and even incongruous thoughts is not intended as a detraction of its excellence. The undersigned, having had some contact and a little experience with the military, has come to the conclusion that this attitude is our best defense and probably our most effective offense. Remember what happened to that poor psychoanalyst!

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Contributions to Mathematical Statistics. R. A. Fisher. New York: Wiley; London: Chapman & Hall, 1950. 655 pp. $7.50.

This volume is the twelfth of the "Wiley Publications in Statistics," edited by W. A. Shewhart, of the Bell Telephone Laboratories. It provides the scientist with a compendium of Fisher's 42 most important papers in their original familiar form, thanks to the industrial uses of photography. Each paper is preceded by a note by the author; also included are a biography of Fisher written by P. C. Mahalanobis, F.R.S., Statistical Adviser to the Cabinet of India, and an excellent index contributed by John W. Tukey, of Princeton. Errors and misprints in the original papers are corrected, and there are occasional modifications of notation for the sake of uniformity. Publication of his collected works, during the author's lifetime, while he is still vigorously turning out statistical research of undiminished quality, canonizes him while he yet lives. May there be a second edition with many additions!

A curious omission may be observed—an omission not chargeable to the author or publisher: the first paper (No. 1), "On the Probable Error of a Coefficient of Correlation Deduced from a Small Sample," *Metron,* 1921, is not there. The author's note is there, but not the paper itself, permission for republication

having been withheld by the established policy of *Metron*.

Because of the unusual character of the book—full-scale reproductions of the original articles—the page size is dictated by that of the *Transactions of the Royal Society*. Indeed, in this journal (Series B, 1922) appeared his famous paper, "On the Methodological Foundations of Theoretical Statistics," which was in the words of Fisher himself, "the first large-scale attack on the problem of estimation."

Space will not permit a rehearsal of the table of contents, which would almost be a list of the most important steps in the building of statistical methodology: design of experiment, theory of estimation, testing of hypotheses, method of maximum likelihood, fiducial probability. Statisticians all over the world will welcome the publication of this book, as it puts the most important contributions of Professor Fisher within reach, in their original familiar format.

The aim of theoretical statistics is better data, detection and elimination of biases and systematic errors, and experiments planned so as to extract the maximum amount of information per unit cost. Such achievement requires a demonstrable index of the precision attained in the experiment, and of the risks of the probable inferences that may be drawn. More important, it requires also the ability to plan the experiment ahead of time so as to attain the desired precision, but no more, in order to conserve funds for other worthy experiments. Correct planning and interpretation require use of the theory of probability, and it is largely from Fisher that scientists have learned this way of thinking, thanks to his two popular books, *Statistical Methods for Research Workers* (1925) and *Design of Experiment* (1935), known to practically all workers in agricultural science, pharmacology, toxicology, biology, and nutrition. With but little modification, the same methods are equally powerful and as necessary for realization of maximum economy and reliability in industrial experimentation, testing of materials, interlaboratory tests, testing of machines, and in physical and chemical measurements.

The use of probability in the hands of Fisher and many others has built a statistical method, and has rescued statistical work from the dry compilation and graduation of figures. Statistical data are now collected and interpreted as *intelligence*, a contribution to knowledge, and a basis for action.

A few words on statistical education may be properly placed in this review. Until recently, books on theoretical statistics were rare. To study the theory of statistics it was necessary to peruse many articles in journals, mostly difficult, and in divers notations, or to be so fortunate as to work with one of the few masters of the subject. Statistical education was thus accessible only in the higher levels of research. During the past five years, however, this situation has started to change. A number of excellent teachable books have appeared, containing authoritative exposition of theory and application, not only in the Wiley series, but from other publishers as well. Statistical education is reaching down into the graduate and undergraduate levels, to the research worker, and even to the administrator. There is no longer an excuse for runs of inefficient tests and experiments, or for runs of unwarranted inferences from experimental data.

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Bureau of the Budget

Les Ultravirus des Maladies Humaines, 2 vols. 2nd ed. C. Levaditi and P. Lepine. Paris, France: Librairie Maloine. 1948. 1,907 pp.

Rapid and continuous progress in our knowledge of the submicroscopic forms of life was made during the decade between the appearance of *Traite des Ultravirus* and the present volumes. The most outstanding contributing factors were the developments and improvements of technique for virus research rather than the discovery of new clinical entities. The relatively compact air-driven supercentrifuge, refrigerated if desired, supplanted to a marked degree the earlier huge, cumbersome oil-driven instruments; refinements in the procedures of tissue culture and the availability of electron microscopes all played major roles.

A wealth of material and an extensive literature forced the deletion of the Rickettsiae from the present edition. Although the rickettsial diseases of man have much in common with certain virus diseases, rickettsial infections are readily distinguishable from virus infections, and the decision to limit these volumes to the human viruses was a wise one.

The authors were aided by 26 collaborators, all specialists in the areas delegated to them. There are 32 main subjects or sections. Between the initial section, entitled "General Considerations and Methods for Investigation," the contents of which are handled in a superb manner, and the final section, captioned "Laboratory Diagnostic Methods," one finds an exhaustive coverage of the important virus diseases and adequate mention of the less common maladies of virus etiology. There are 368 figures and 3 colored plates. The editing has been done with great care to ensure retention of the writer's personality in each instance. The bibliography for each section is encyclopedic. Full recognition is given to the literature in English, German, and other foreign languages. Scientists, particularly my English-speaking colleagues, might well profit by this familiarity with, and acknowledgment of, the contributions of others.

Unfortunately the authors' task is not complete. It will be necessary to publish the third edition of this monumental work promptly so as to keep abreast of progress in this field. In the meantime, the present edition should be in every laboratory and research institution where the infectious diseases are under consideration.

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