University of Minnesota to undertake during 1943-44 a study of semi-starvation in volunteers under laboratory conditions. Thirty-two conscientious objectors offered themselves as subjects and lived in the laboratory of Physiological Hygiene for over a year.

During a control period of three months they were given a diet containing approximately 3,500 calories per day. Then for 6 months the diet was reduced by 1,570 calories in the form of potatoes, cabbage, turnips, and cereals, and only very small portions of animal protein each week. The experimental diet resembled approximately that consumed under famine conditions in Europe. During this period they lost on an average 24 per cent. of body weight, and were reduced to a condition closely resembling famine victims. All at some time had famine oedema. The subjects were then studied for a further 3 months in the laboratory under various regimes of rehabilitation, and most of them were observed at intervals for a further 6 to 9 months. A year after the end of the starvation period, all had returned to normal and were apparently none the worse. During the year in the laboratory the basic physiological and psychological state of the subjects was reviewed at regular intervals by teams of investigators. Important observations were made on the weight changes, the distribution of body fluids, the basal metabolism, the energy exchanges during exercise, the capacity for work, the size of the heart, adaptations in the circulatory system, and changes in the cellular elements in the blood. The psychological observations included studies of behaviour patterns, personality changes and intellectual abilities.

The many important findings cannot be summarized in a review article. The Minnesota experiment, which will become a classic, was planned and executed by a co-ordinated team of first class investigators, and there is no record of any comparable experiment either in human physiology or in psychology. The general plan will be of interest and indeed an obligatory study for future investigators into the problems presented by adaptation of the physiological and psychological processes in man to prolonged adverse environmental conditions, and the details are important to those concerned with the practical problems of medicine in a famine.

Unfortunately the choice of presentation of this great experiment is unsatisfactory. "Human Starvation" weighs 3.45 kg. and suffers, like many American books to-day, from over-nutrition. Striving for completeness, the authors have stuffed the book with observations made by persons less competent or less well-placed than themselves, and in consequence the fascinating account of the Minnesota experiment is often buried. Chapter 3, containing 29 pages, is entirely devoted to old work, long dead, which might have been allowed to rest; there are many other examples of the citation of inferior work.

There must be many physiologists, psychologists, and physicians who would like a brief straightforward account of this great experiment for their personal use. Is it too much to ask Professor Keys to provide such an account, which would fall within the limits of a private purse, and slip easily into the suitcase of a physician setting out by aeroplane on famine-relief work?

R. Passmore


The new edition of Yule and Kendall invites comment on one of many dilemmas consequent upon the rapid tempo and increasing output of research in every branch of science. It is to the advantage of a publisher who enjoys the good will of a well-esteemed textbook to keep it in circulation by constant revision after the author himself has lost interest in its fame; but the production of a comprehensive new textbook is a thankless task for young men whose chances of promotion to an important teaching post in university life have very little connexion with proven powers of exposition. The main preoccupation of the young scientific worker, if disposed to write a book at all, is indeed to write one
BOOK REVIEWS

about recent advances. Books of that sort are commonly, and especially in a theoretical branch of knowledge, a sounding board for one school of doctrine. If one may sometimes be tempted to wonder whether the new wine of research has burst the old bottle of the publisher's good will, one may therefore be grateful that the student can still turn to sources which take stock of techniques or conclusions accredited by long usage and refined by long-standing controversies.

In its original form, Yule's textbook belongs to the period when statisticians did not dismiss as pedestrian the task of devising summarizing indices designed to sidestep erroneous conclusions seemingly justified by crude rates, and to bring into focus what is essentially relevant in the data of an investigation. The exclusive preoccupation of our own generation being with the problem of significance, there is a danger of forgetting that the primary function of a summarizing procedure is to summarize.

A single illustration will suffice to bring this distinction into focus. If one is concerned with the assessment of a therapeutic procedure, one may legitimately summarize one's data in either of two ways.

One is to cite the percentage difference of cures with its standard error. If so, the tabulation exhibits all that is relevant to a significance test by recourse to the normal integral, and what is of primary importance, the magnitude of the effect. It is important to emphasize the last consideration, because a large-scale trial difference may be highly significant in the statistical sense and quite trivial from an operation viewpoint vis-à-vis the additional cost or inconvenience of adopting one therapy in preference to another.

Regardless of the fact that Fisher first showed that testing the same data set out in a 4-cell table by the $\chi^2$-square distribution for 1 d.f., and likewise regardless of the fact that the $\chi^2$-square table for 1 d.f. contains no additional information to that obtainable from the table of the normal integral, almost every new textbook recommends to the student to lay out the crude numbers of a trial for a $\chi^2$-square test in a 4-cell table from which the reader can infer nothing about the magnitude of the proportionate difference involved without doing the arithmetic.

Algebraically and numerically the two procedures are identical, if one's only concern is with significance in the statistical sense, and both summarize the same information from that viewpoint in essentially the same way; but the second method, in some textbooks actually referred to as the Modern, does not explicitly summarize what one really wants to know as a guide for action.

No doubt it would be a great service if a teacher of statistics would write a book to bring into focus how much in the older tradition is of enduring value and what are the limitations inherent in the logical postulates of new techniques popularized by a formidable library of cookery books for mechanical use by research workers all too often unduly eager to follow the latest fashion. Since nobody has yet done this, one may be grateful that the publishers of Yule's classical manual have found such a distinguished statistician as Professor Kendall to undertake an unrewarding assignment. Probably, none more than he would appreciate the impossibility of a wholly satisfactory outcome to such an undertaking, but experienced teachers who also recognize the difficulties will be grateful to him for what he has done.

LANCELOT HOGBEN