oxalic acid is made by the action of nitric acid on strong alkalis (p. 349), and even a fourth-form school-boy will smile at the statement that the specific gravity of degras (unpurified wool fat) is about 92 (p. 162). No doubt the latter is an uncorrected printer's error, as also is the formula $NaSO_4$ for saltcake (p. 472), and the statement that benzyl bromide is made by mixing bromide and toluene (p. 63). Trade buyers, executives and foremen, in particular, are unlikely to be edified by the assertion that dextrine is "a starch with a smaller value of x in the molecule"; and though, as the author states, it was clearly impracticable to give references or quote authorities, one would like to have corroboration of the statement that acetic acid occurs in citrus fruits and vegetables (p. 5).

Among the few omissions noted is the absence of any reference to synthetic acetic acid and the manufacture of nitric acid by oxidation of ammonia. There is a great wealth of data concerning metals and alloys, but chemical materials are treated somewhat cavalierly; for example, only eight lines are given to methyl alcohol, fifteen to benzene and seventeen to 'alkalis'; in fact, a better title for the book would be "Handbook of Engineering Materials". British trade names are conspicuously few, but no doubt a limit had to be set to the size of the volume; as it is, no fewer than about 4,500 substances are dealt with, and this fact alone should ensure a wide and successful appeal among those who desire a reliable and reasonably up-to-date compendium of the marketable commodities used in engineering and allied industries.   E. H. TRIPP.

MODERN STATISTICAL METHODS

The Fundamental Principles of Mathematical Statistics
With Special Reference to the Requirements of Actuaries and Vital Statisticians; and an Outline of a Course in Graduation. By Hugh H. Wolfenden. (Published for the Actuarial Society of America, New York.) Pp. xvi+379. (Toronto: The Macmillan Company of Canada, Ltd., 1942.) 5 dollars.

Sampling Methods in Forestry and Range Management
By F. X. Schumacher and R. A. Chapman. (Duke University School of Forestry, Bulletin 7.) (Durham, N.C.: Duke University Press, 1942.) 2 dollars.

THE contemporary population of the United States seems to have not only a taste but also a distinct genius for statistical research. It does not follow, however, that American mathematicians have at all uniformly shown a talent for expounding mathematical statistics. The contrast is one of the most interesting in contemporary science. Obviously it springs largely from the detachment and isolation of many mathematical departments from the fields of application; so far that expositors do not appreciate, or indeed even know of, the mathematical advances used in practice. This paradoxical situation has, of course, its lessons for other countries and for other disciplines.

Mr. Wolfenden has written an original book. It is scarcely what its title (on the cover) claims, a presentation of "The Fundamental Principles of Mathematical Statistics", but rather an introductory course of reading for actuarial students, and "an Outline of a Course in Graduation". This course, which occupies

two thirds of the book, is divided into three sections: (a) history; (b) mathematics and interpretation; and (c) applications.

The stress laid by the author on the importance of history is most refreshing:

"I therefore believe it essential to the proper understanding of any subject to absorb the history of the mental processes which have guided its development. This study, accordingly, is framed on that conviction. It is hoped, however, that the arrangement used will enable the reader to acquire the background easily, and in a manner less destructive of imaginative interest than is so often inseparable from the teaching of history *per se*."

A text-book is often thought to be a suitable sarcophagus in which to lay undisturbed the embalmed remains of obsolete methods. One valuable use of a historical as contrasted with a mathematical section might be to separate the living from the dead. The contributions of the twentieth century have, however, suffered in Mr. Wolfenden's hands. "Student's" method is much ill treated, and I read with pain of the analysis of variance "arising from Lexis's theory, based in fact upon the 'correlation ratio'". Such comments are not historical. I venture to suggest that the first two hundred papers, at least, employing the analysis of variance do not make any use of Lexis's theory, or of the correlation ratio; and, for such part as I had in developing the method, I was at that time strongly conscious of the failure of the methods developed by Lexis and Pearson to solve even the simpler problems of this type which they discussed.

Whereas Mr. Wolfenden's title seems to invite too wide a class of readers, Schumacher and Chapman's paper-covered bulletin from the School of Forestry at Duke University, entitled "Sampling Methods in Forestry and Range Management", might properly have been addressed to a much wider audience. It constitutes an altogether excellent introduction to modern statistical methods, and its success in this respect seems to flow directly from the fact that the authors' aims are not academic, but are concerned only with a competent planning and handling of this aspect of practical forestry.

The utmost care is taken to give the reader a clear grasp of the elementary concepts which all statistical work involves; but this does not mean that only unimportant ground is covered. Degrees of freedom are introduced in the first chapter; "Student's" method and inferences of fiducial probability appear in the second. Part 2 is concerned with direct estimates by sampling, introducing the effects of the finiteness of the population sampled; stratified random sampling; the simultaneous use of several variates; sub-sampling and representative sampling. Part 3, on indirect estimates, gives a thorough account of the uses of regression, not neglecting the use of weights.

An appendix includes technical notes on mathematical points requiring further discussion than that given in the text. In respect of the factor $\left(1 - \dfrac{n}{N}\right)$ used in the variance of samples from finite populations, I would suggest that the student can gain a clear idea of its origin from the circumstance that sampling errors only affect his estimate of that fraction of the whole which is not included in the sample. The technical note on this point thus seems unduly heavy.

R. A. FISHER.