REVIEWS

The Practice of Life Assurance. By N. E. COE and M. E. OGBORN.

[Pp. x+440. Cambridge. Published for the Institute of Actuaries and the Faculty of Actuaries at the University Press, 1952. 323.]

THIS book is one of a series of text-books published under the authority of the Institute and the Faculty of Actuaries and designed for students preparing for the actuarial examinations. The present volume is, practically, the only recommended reading for Part IVA of the Institute examinations, and it is also recommended, along with many papers and discussions published in $\mathcal{J}.I.A.$ and elsewhere, as preparation for the more advanced treatment of life office work in Part IVC.

The authors state in the preface that the word 'Practice' in the title is not meant to exclude theoretical aspects, and that the book is about the problems that come before the life office actuary. Broadly, the subjects treated are premium calculations, underwriting, valuation of liabilities and assets, distribution of surplus, and surrender value and similar calculations; in the general introductory section the principles of life office investment are also discussed. In short, the book deals with life office finance.

The student coming to Part IV of the Institute examinations is familiar with the mathematics of premiums and reserves. At this stage he is required to consider the various elements entering into the calculations, such as mortality, interest and expenses, and the numerous methods available for such processes as valuing the liabilities and distributing surplus. A large proportion of actuarial students are employed in life offices, and by the time they reach the later stages of the examinations they will have made some acquaintance with certain aspects of these problems. For such students, this book will serve to co-ordinate much of the knowledge already gained in practice, and at the same time to enlarge their ideas beyond the practice of their own office—and even of their own country, for there are frequent references to overseas practice, especially in U.S.A. and Scandinavia. It is difficult to estimate the impact on the occasional student without life office experience, but at least he is likely to get a clearer picture of the subject as a whole from the book than from numerous disconnected papers.

The book is divided into three main parts. The first part deals with general considerations affecting both ordinary and industrial life assurance. The second part treats in more detail the problems of ordinary business, while the third shows how the principles are applied in the special conditions of the industrial branch.

In the first of these parts, a most interesting review is given of the history and development of life assurance, both in this country and in other parts of the world; this forms a valuable background to present-day thought and methods. Two further chapters give an outline of the implications of the legal requirements and the taxation system affecting life assurance companies in the United Kingdom. Between these is a chapter of the first importance on the investment of life assurance funds. It is unfortunate that this should have been written before the publication of two recent papers in which this subject was systematically investigated.* As it is, the authors approach the question with certain illustrations

* Haynes & Kirton, T.F.A. XXI, 141; Redington, J.I.A. LXXVIII, 286.

that do not seem to be particularly illuminating to the student, and while they do indicate some of the ideas explored in the papers referred to above, it is likely that the chapter will be extensively revised in the next edition of the book. In the meantime the student would be well advised to have at least a general acquaintance with these papers. Further chapters in this part of the book deal with what are called the 'elements' in the calculations—that is, the 'basis' in the broadest sense—and with the principles of actuarial valuations; suitable emphasis is given to the objectives in view.

The second and longest part of the book is devoted to the actuarial principles and methods of ordinary life assurance. The chapters on office premiums, extra risks, and underwriting are relatively straightforward, and it may be remarked how small a proportion of actuarial literature treats of these fundamentally important subjects. The chapters on valuation and surplus on the other hand reflect the vast amount that has been said and written on these topics, and here one must admire the wide range of the treatment, and the analysis, even if necessarily condensed, of many different methods. This part closes with a chapter called 'Pension schemes, disability insurance and options', and it may be misleading to find that the second and third of these subjects are dealt with first and occupy most of the chapter while the much more important matter of pension schemes is dismissed in only nine pages.

The section on industrial assurance is greatly helped by the exhaustive treatment in the preceding sections of many of the problems that are equally applicable to industrial business. This has made it possible to give a very clear picture of the organization and actuarial problems of the industrial branch, which should be readily appreciated by the student without experience of this business.

The text-book treatment of life assurance finance is largely new, at any rate in this country. Two sources which have been drawn on to some extent for the present volume are the books in the Consolidation of Reading series, *Valuation and Surplus* by Lochhead and *Office Premiums and Extra Risks* by Gunlake and Wood; while the latter is virtually a text-book the former is designedly a guide to other reading. The text-book method has of course limitations as well as advantages. It may be felt that reference to original papers and discussions is desirable for students at this stage of the syllabus, but any criticism on this score may be countered by reference to the extensive bibliography provided at the end of each chapter, and also by the thought that many students preparing for Part IVA will concurrently be studying for Part IVC where more extensive reading is required.

Although it must be said that the treatment is admirably objective, and free from personal bias, a book of this kind about subjects requiring the exercise of individual judgment must inevitably be influenced by the point of view of the authors. The general conception of the life assurance fund presented in the book tends to be that of a fund built up out of premiums which contain considerable margins, and distributed according to equitable principles—in other words the emphasis is on participating business and on the valuation as a means of preserving equity and continuity. This is the historical approach and it may still apply to much of the business, but a very large amount of long-term life assurance and deferred annuity business is to-day being written on a non-participating basis, and for this business the premium scale rather than the valuation is of fundamental importance. Another obvious limitation of any such text-book is that the subjects treated are continuously under the influence of contemporary

thought, and reference has already been made to developments in ideas on life office investments since this book was written. Moreover, the financial, legal, and taxation background is liable to change, and, for example, the paragraph in page 433 on profits tax on capital redemption business does not now seem to be applicable.

The student opening this book will find many pages—in clear large type unbroken by formulae or tables, and the first impression may be that the book will be easy reading. This is far from being so; the scope and complexities of the subject have necessitated a condensed and concentrated treatment. The book is not one to be swallowed whole, and almost every paragraph will require careful study, with paper and pencil ready at hand.

The general feeling left is one of admiration of the thorough treatment, and of the amount of research that must have been undertaken in the production of the book, which will certainly be valued both for its own sake and as a foundation for any similar future work. J. M. B.

Associated Measurements. By M. H. QUENOUILLE, M.A.

[Pp. x+242. London: Butterworths Scientific Publications, 1952. 35s.]

IN recent years there have been great developments in statistical methods of dealing with associated measurements and it is probably true to say that the product-moment correlation coefficient, which used to have such prominence in text-books is now largely used to indicate where more refined methods may most profitably be applied. This book deals in a thoroughly practical manner with the modern methods and illustrates them by application to numerous sets of numerical data. Proofs are not given but some stress is laid on the basic assumptions underlying the methods of analysis. In his preface the author claims for his presentation that

the non-mathematician should therefore be able to follow the methods given, while the mathematician should derive a deeper understanding of the processes involved in the investigation of associated measurements.

There is considerable danger of misapplication in expecting a non-mathematician (assumed to mean someone who has not studied mathematical statistics) to apply advanced statistical methods presented mainly as numerical examples, but, in the reviewer's opinion, the danger is slight so far as this book is concerned. The style is condensed and quite an amount of statistical knowledge is assumed, so that it seems unlikely that a non-mathematician would attempt to apply any but the more elementary of the methods described. On the other hand; one who has only studied the methods in mathematical form should derive great benefit from the book. He will gain from the examples a greater appreciation of the scope of the methods and of the variety of situations to which they are applicable —matters often rather obscured by mathematical presentation.

The book is divided into four sections of almost equal length. The first gives an excellent description of graphical methods of investigation and testing, and shows the power of graphs and diagrams in the preliminary analysis of numerical data in order to determine the best course of analysis. The second section describes the basic methods of numerical analysis for two or more variables analysis of variance and covariance, correlation coefficients, regression equations (linear and curvilinear). The reader is however referred to 'a more elementary

text' for a complete account of the analysis of variance and covariance which are here 'rapidly considered'. Further developments and adaptations of the methods are described in the third section, while the last deals with recent work on the analysis of time series and multivariate analysis. An appendix gives tables of significance levels for the tests described and there is a bibliography of further reading.

As is now customary, matrix notation is used when considering more than two variables, and numerical methods of dealing with matrices are described. A knowledge of matrix algebra is therefore necessary for the full understanding of these sections but an acquaintance with determinants will take the reader some way.

The book is well printed and laid out, but a protest must be made against the frequent use of the dash to indicate 'to', which is most confusing. For example (page 142), x_1-x_6 means x_1, x_2, \ldots, x_6 and in the table on page 174 '-15-75' means '-15 to +75'.

The book should be of considerable service to the statistician who has to deal with the practical analysis of associated measurements—a subject which does not seem to have received the attention it deserves in text-books. R. H. D.

Numerical Analysis. By D. R. HARTREE, F.R.S.

[Pp. 287. Oxford University Press, 1952. 30s.]

THE development of electronic computers during the last decade has made it possible to perform calculations which have previously been beyond the scope of available methods. However, in spite of the speed and capacity of these machines, most small calculations and much research work will still continue to be performed by methods involving desk calculating machines. Furthermore, the need for a proper study of each individual problem in the light of all the various methods available will still persist and, in fact, be increased.

In practical problems the more important stages are usually the preliminary considerations of the nature of the problem, the numerical stages being a part only of the work. Thus, in solving a set of linear equations derived from observational data, preliminary investigations will frequently bring to light poor conditioning which would lead to an unsatisfactory solution.

In fact, the successful computer requires considerably more than a knowledge of numerical methods and computing technique; he requires a feel for the arithmetical form of problems. It is in this field that Professor Hartree has prepared this volume, drawn from his wide background of numerical treatment of practical physical problems.

This is not just another book on computation, and it presupposes a working knowledge of elementary mathematics—calculus up to Taylor theorem and partial derivatives, differential equations and the simpler properties of matrices. Emphasis throughout is on the practical object in view, and by well-chosen examples important devices in computing technique are brought into relief, including some of the commoner forms of mistakes likely to be made and means for their detection.

After a pertinent introduction on the nature and scope of numerical analysis there follows a chapter devoted to the various devices available for computing. A short chapter on evaluation formulae, including a reference to the difficulties arising when a function becomes indeterminate, is succeeded by an up-to-date

treatment of finite differences and an effective chapter on interpolation. Quadrature formulae are treated in Chapter 6 and integration of ordinary differential equations in Chapter 7. The next two chapters treat simultaneous linear algebraic equations (including matrices) and non-linear algebraic questions respectively. Chapter 10 gives a valuable discussion of problems involving two variables and Chapter 11 is devoted to various topics not conveniently included elsewhere. Finally, Chapter 12 gives a brief description of the principles involved in preparing problems for an electronic computer.

As will be appreciated from the foregoing, there are a number of topics covered by the book which are outside the scope of normal actuarial work and training, but the actuary interested in numerical work will find this book well within his mathematical equipment and a most stimulating treatment of the subject. Some aspects of numerical methods, which have been intensively developed by actuaries to deal with their own particular problems, find no place in the book; in particular, graduation finds no more than a small reference in Chapter 11 and product-integration formulae are covered by a page-and-a-half devoted to the Gaussian formulae.

The principles described in the book are adequately illustrated by means of carefully selected examples, in some of which deliberate mistakes have been introduced, so materially increasing their usefulness. An appendix giving 41 exercises is given, and a useful bibliography giving the source of many of the processes described in the text is provided.

A number of misprints have been noted, of which the following might mislead students:

- p. 49. 2nd and 4th lines from bottom of page, for $f_{j+\frac{1}{2}}$ read $\delta f_{j+\frac{1}{2}}$ in two places.
- p. 74. $E_1^{ii}(\theta)$ in line 3 should be $-\frac{5}{81}$, not $-\frac{1}{81}$.
- p. 93. A factor in the denominator of each of the 2nd and 4th terms in formula (5.39) is wrong and the value 2.933 in line 12 should read 2.923.
- p. 193. The value of $12/x_4$ given as 3.46410.16158 should be 3.46410.16303 with consequential alteration to x_5 .
- p. 195. $\sin x_1 = .609259$ should read .609159.
- p. 208. For 2.76 in two places in the top table read 3.76. The column of sin 3y in the lower table is wrong except for the value corresponding to $x/\frac{1}{6}\pi = 2.0$ (with consequential alterations).

These are, however, minor blemishes in a book that can be highly recommended to and should certainly be read by all interested in numerical methods.

R. E. B.

Professional People. By Roy Lewis and Angus Maude, M.P.

[Pp. viii+284. London: Phoenix House Ltd., 1952. 18s.]

THE rise of the 'experts' is at once the accompaniment and the condition of the continued rapid material progress of the present century. Their significance, in a society so dependent on scientific advances and their applications, cannot be questioned. But the inevitable growth in the numbers of and the ever-increasing specialization among the experts are giving rise to a whole series of problems concerned with their relative status and rewards, their education and training, the part they should play in administration and management, and especially the

maintenance of professional ethics. It is not infrequently claimed that 'management' itself is yet one more 'profession', entitled to recognition as such, with that corporate expression which the practitioners of every form of expertise have come to regard as essential to the protection of the public-as well as of the interests of the practitioners themselves. The advent of the Welfare State, the nationalization of basic industries, and the growth of large-scale organization in particular sectors of private industry have all led to direct salaried employment of considerable sections of the 'professional classes', as this term is commonly understood, with the result that in law, medicine and accountancy, for example, the old personal relationship between professional adviser and client has often been destroyed or at least, as in medicine, modified in important respects. Who in fact pays the fee or other remuneration, and to whom the professional man is accountable, have become something more than matters of mere form. The publication of the present work is timely, for the Welfare State is no longer a matter of political argument. Controversy is now mainly concerned with the pace of extension of 'free' services, etc., of the best quality, to all. That 'welfare', so understood, should be available on the basis of 'need' and not of ability to pay has naturally created a strong demand for yet more specialists of all kinds to provide the services which the general public have been led to expect and demand as of right. It is to the social consequences of the growth in the numbers and categories of experts, and of the shortage of recruits with the requisite intellectual equipment and training, that the authors devote much attention.

Although they make a heroic attempt to cover the whole field, they seem to have been preoccupied with the problems created by socialized medicine. At any rate, most space has been devoted to the medical profession and the 'medical auxiliaries'—as such specialists as almoners, physiotherapists and radiographers are officially termed—and for a very good reason. It is the authors' basic contention that the practitioner-client relationship, hitherto so dominant in medical practice, is vital to the continuance of the historical and conventional conceptions of professional ethics. For this reason, indeed, it is sometimes suggested that only private practice confers professional status, though, as the authors concede, it is certainly 'very difficult to exclude the professional salariat from the professional classes', e.g. medical officers of health and the permanent legal advisers to government departments, local authorities and large corporations. They consider nevertheless that by far the greater part of any professional code has relevance only to private practitioners, and they contend ^{*}that the standards of any modern profession are ultimately maintained by the example set by private practice'. Hence, they argue, comes the need to retain a proportion of fee-earning private practice in medicine, for example, and also to preserve, for education, the stimulus of the public schools.

The authors are greatly, and properly, exercised about the impact on professional ethics of socialization. How long, they ask, will the mine manager use his own judgment and ruthlessly set aside suggestions from 'functional experts' at headquarters, as if he were answerable to law and his own engineering conscience alone? How long, again, will the doctor continue to behave as if he were in a professional relationship with the patient, if he is made to feel that he is employed by, and strictly answerable to, a local or national authority? The essential need seems to the authors to be the preservation of personal responsibility to the client 'in the professions which set the tone for the others primarily law and medicine'. The professions must, too, seek financial freedom from State interference analogous to that enjoyed by the Universities which receive very large grants through the agency of the University Grants Committee.

How far private practice can be maintained in professions other than law and medicine the authors regard as doubtful. The cult of Bigness, nationalization, and the State employment of so many scientific specialists in teams, they say, are all against it. 'But undoubtedly all professional bodies should become aware of the importance of preserving private practice, and promoting the interests of consultants, whenever they can.' The authors make the important suggestion that professional men and women in positions of responsibility should 'consistently press the possibility of going "outside" the organizations for professional services wherever possible, rather than trying to create specialized departments'. This, of course, runs counter to the prevailing vogue of highly-centralized organization.

The authors establish a convincing case against the creation of a profession of management—at least one trained separately from the other professions. Managerial ability, they point out, is extraordinarily flexible as regards its range of application. They quote, with approval, Sir Miles Thomas who recently told the British Institute of Management that 'character, sincerity and commonsense are frequently worth more than specialized training when it comes to assessing the higher executive jobs that men are fitted to undertake...'. If the professions are to maintain their independence, they have to meet this difficult problem of training administrators.

There is much else in this important study that affords food for reflection. It is all the more unfortunate, therefore, that less than justice should have been done to the actuarial profession, especially as the book is held out as 'particularly valuable to parents and students'. Thus, it would appear that the authors have never heard of consulting actuaries. They say, page 109,

the individual actuary, and insurance expert proper, is a member of a qualified profession wholly employed in salaried positions, and to which therefore no special professional attribute attaches.

This diagnosis of the status of the actuary flows doubtless from the authors' insistence upon the 'practitioner-client relationship' as affording the only true basis for a 'profession'. Absence of knowledge about actuarial consulting practice, whether whole-time or part-time, is also reflected in an important tabular statement (pp. 72, 73) about the 'Characteristics of Professional Status' under the five headings: 'Registration or State Certification'; 'Practitioner-Client Relationship'; 'Ethical Code'; 'Ban on Advertising of Services'; and 'Independent, but service of a fiduciary nature'. Actuaries are entered under the third but not under the second and fourth headings although, for example, Accountants, Stockbrokers and Veterinary Surgeons are entered under all three.

There are two other references to actuaries which can only be discouraging, as well as misleading, to 'parents and students'. Thus, it is stated (page 56) that An actuary's training requires fundamental knowledge of mathematics but, on the other hand, it represents an extremely narrow *expertise*, cloistered and theoretical.

The authors clearly have an impression of the actuary as little more than the 'back room boy' of life assurance. The facts are that in addition to their purely technical work for life, pensions and sickness insurance (both private and national), actuaries, precisely because of their basic training and experience, are also employed as investment managers, and as managers both in life assurance and in the wider insurance world; in the Government Actuary's Department and

eight other Departments of State; in local government; in consulting practice (whole-time and part-time); in stockbrokers' offices; and in nationalized and private industry. In fact, at a recent date, out of some 480 'active' Fellows of the Institute in this country, the number employed in Life Offices was roundly 350. The volume of consulting practice is, of course, considerably greater than would appear from the number employed in whole-time consulting practice; while the steadily increasing group in 'Industry and Commerce' has now reached 44 (employed in 27 undertakings) compared with only I in 1925.

But the parent or student, repelled by the adjectives 'narrow' and 'cloistered', might nevertheless wonder whether there were perhaps compensations in the remuneration that could be obtained. All they are told, however, is (page 248) Insurance employees do a little better than bank clerks; actuaries may start at nearly twice the salary and should be earning $f_{.800}$ a year by the age of 35.

The rates of actuarial remuneration are well-known to be relatively high and the majority of actuaries aged 35 fall into the £1000-2000 range. The Institute's opinions on this point are set out in the booklet entitled *The Actuarial Profession*, the 1951 issue of which is now under revision. The next issue will presumably show higher figures than those prevailing when the booklet was being prepared. 'F.I.A.' on page 58 should obviously be 'F.A.I.'

It can only be hoped that these blemishes will be removed in a second edition

of *Professional People* for which there should surely be a demand in view of the book's thought-provoking qualities. F. A. A. M.