

## REVIEWS

*A History of British Insurance.* By HAROLD E. RAYNES, F.I.A., F.C.I.I.

[Pp. vii + 397. Sir Isaac Pitman and Sons, Ltd., 1948. 35s.]

IT is fitting that the first comprehensive history of British insurance should be written by a member of the Institute, and peculiarly so that the member should be Mr H. E. Raynes, for, during the Institute's existence, few of its members can have had such wide educational interests as he. The Institute's main activities have necessarily been in other fields but, from its foundation, it has had members who have been interested in the history of insurance, as both the early numbers of the *Journal* and the Centenary publications show. Moreover, in 1884 the Council awarded the first 'Samuel Brown Prize' to Cornelius Walford for his valuable *History of Life Assurance in the United Kingdom, F.I.A.* Vols. xxv and xxvi, a contribution to which all historical students turn, but to which the present work invokes a striking contrast.

That contrast lies less in the wider range of Raynes's subject than in his treatment of it. Walford was not less painstaking in research; he, too, brought new facts to light; he, too, expressed himself with considerable perspicuity; but he mistook chronology for history. For the author to have compressed into less than 400 pages the story of British commercial insurance from its medieval Italian origins down to 1946 is a remarkable feat; it had demanded a power of selection from a vast volume of research which many professional historians might well envy and, in the result, it is history, for the author skilfully relates his subject to the wider social and economic developments of which it is but a part.

Thus, whereas even Wright and Fayle in their *History of Lloyds* were content to refer to the Usages of Lombard Street as 'a body of customary law... from Italian merchants and financiers who gave their name to Lombard Street', Raynes takes the trouble to show that this customary law was part of the international law merchant, and to explain why the Italians and other foreign merchants were then domiciled in London. So, too, the authorization of charters to the London Assurance and to the Royal Exchange Assurance by the Bubble Act, 1720, is placed in the setting of the evolution of the joint-stock company, and it is noticed that these two historic corporations were following the East India Company, the Bank of England and the South Sea Company in offering the government financial consideration for the rare privilege of incorporation. Similarly, it is hardly possible to understand the early and rapid development of fire insurance in eighteenth-century England without the appreciation of the economic changes wrought by the industrial revolution and of the reasons why that revolution first took place in Britain. Workmen's Compensation insurance is shown to be the outcome of the social legislation of an era of reaction from *laissez-faire* as the nineteenth-century drew to a close. And, though it might be wished that the author had, in his final chapter, more definitely related the amalgamations among the larger insurance companies to the wider combination movement in industry as a whole during the twentieth century, yet we are given cogent reasons for the insurance amalgamations themselves.

Opinions may be divided about how far the omission of any reference to industrial assurance is justified; true, it is, as the author claims, related to social

insurance, but still more so is workmen's compensation insurance which receives a chapter to itself. It is even more to be regretted that one who has himself written elsewhere on insurance companies' investments should not have given us a chapter on the tendencies revealed from a historical survey of that subject; and might we not have hoped that a former chairman of the Life Offices' Association would have drawn aside the veil to show us the activities of that Association in the same way as he does so satisfyingly in respect of the beginnings of the Fire Offices' Committee? Nevertheless, let us be grateful for what we have, which is not a little.

A sound historical perspective is shown in devoting nine out of the twenty-one chapters—including the first six—to marine insurance; for, whereas accident insurance is but a century old, scientific life assurance less than two centuries old, and fire insurance less than three, marine insurance dates from the early fourteenth century; and from marine insurance are derived important conceptions applicable to insurance as a whole. Marine insurance originated in the necessity of separating the credit and insurance functions of the ancient contract of bottomry in order to facilitate the investment of trust funds in maritime ventures. Such a separation was effected in Florence and Pisa; the early underwriters were merchant bankers who had a network of agencies and branches throughout Western Christendom, and so the practice spread—to Bruges and Genoa in the fourteenth century, to Barcelona, and to London where, as early as 1318, the Florentine House of Bardi had secured the grant of a tenement in Lombard Street.

Our knowledge of the earliest English marine policies is largely based on the records of the Admiralty Court, to the origin and purpose of which Mr Raynes deftly refers when examining the records. It was partly the inability of that Court to deal effectively with marine insurance disputes which led to the intervention of the government in 1575; and in an illuminating chapter, which may be commended to all students of Elizabethan England, our author is the first historian to deal adequately with that creation of the Privy Council, the Chamber of Assurances. Though he omits the point that it was in an age prolific in the sale of monopolies by the Crown that the Registrar of the Chamber paid £200 in 1575 for his patent (£400 for its renewal in 1605), he shows that the Chamber was much more than an office where the Registrar attempted to usurp the functions of broker and notary; it was an arbitration tribunal. Again, if it is left to be inferred that the decree of the all but omnipotent Privy Council, unlike an Act of Parliament, had no power to require conformity from those of Her Majesty's subjects possessed by 'wilfulness and froward disposition', it is clearly shown that the Assurance Court, established by Parliament in 1601, was an engraftment on to the original Chamber of 1575.

Research into the scanty evidences of the work of the Chamber-Court (and its Registrar) helps to solve what had been regarded as 'one of the riddles of commercial history', the standardization of Lloyd's marine policy. And as the decay of the Chamber-Court approximated to the expansion of foreign trade, so the problem of interpretation of the law merchant in general, and of its insurance section in particular, is resolved by the incorporation of both into the Common Law, largely by William Murray, Earl of Mansfield, an account of whose brilliant judgments occupies the larger part of the chapter on eighteenth century marine insurance law. That law was modified in part by Parliament. The Act of 1746 with its 'interest or no interest. . . ' is well known. Less well known is an Act of 1748 imposing restrictions on the insurance of enemy ships and merchandise 'during the present war' with France. Although not mentioned by the author,

the 1748 Act had, in the House of Commons, been opposed by the same William Murray in a speech which illustrated that 'logic and discernment' which were a few years later to be applied from the bench. In the same year (1748), too, the House passed Resolutions affecting marine insurance practice, the first of which embodied principles later 'laid down by Lord Mansfield in *Lewis and Another v. Rucker*'.

Space will not permit full notice of the remaining chapters on marine insurance, nor, indeed on others in this fascinating book. Yet they provoke not a few questions of varying importance. Thus, was the government of 1824 actuated solely by free trade motives in the repeal of the quasi-monopoly under the Act of 1720? Had the Mr Grenfell, who opposed the repeal, any financial motive for the tenderness he showed to existing interests? Among the causes for the recovery of Lloyds from the apathy of the eighteen-seventies, should not the continued growth of the marine market be accorded a place? A question of a different kind is raised in that valuable contribution to the history of the business corporation—the chapter on insurance companies in the eighteenth century. Limitation of liability, says the author, was not conferred by the mere fact of incorporation. He may be right, but it is as well to notice Sir William Holdsworth's opinion that it was so conferred 'was clear. . . as early as the fifteenth century. . . and, after some hesitation. . . was generally accepted in the latter part of the seventeenth century' (*History of English Law*, Vol. VIII, p. 203).

In a way the chapter on early life assurance is relatively less satisfying than the others. The author does not press back to origins to anything like the same extent as he does with marine insurance, with which early life assurance is so closely allied. In dealing with eighteenth-century England, Thomas Simpson's construction of a London mortality table is mentioned without reference to that of John Smart of the Guildhall published in 1738 of which Simpson's (1742) was an adaptation. Also, acceptance seems to be given to William Morgan's statement—made in 1828—that Simpson had recommended the foundation of such an institution as the 'old' Equitable (1762); yet exhaustive research has failed to discover any interest on the part of Simpson in life assurance. Moreover, had Mr Raynes spent his business life north of the Tweed it is unlikely that he would have omitted reference to Alexander Webster and to the still flourishing Church of Scotland Fund which, established in 1744, is presumably the oldest existing society for life contingencies in the world. In his projection of the Scottish Widows in 1810–11 David Wardlaw was avowedly actuated by the desire to 'extend to all ranks' in Scotland benefits akin to those of the Fund; and the Fund was the model for the oldest life assurance society in the United States, established in 1759. The author became aware of some of these facts after the draft of his book was completed, and it might very well be that, with characteristic generosity, he preferred to leave their publication to other research workers. Yet the history of the Fund has yet to be written and none is better qualified than he to undertake that task.

The criticisms which this book has provoked are a tribute to its merits, for the criticisms of its contents are on details; and the references to omissions are but indications of possible avenues for others to pursue. Nothing can detract from the strength and sweep of the main vision, nor from the gratitude which the student of insurance and the historian of commerce must feel to an author who has given them so much.

*Life Assurance from Proposal to Policy.* By H. HOSKING TAYLER, F.I.A., A.C.I.I., and V. W. TYLER, F.I.A. Fifth Edition by H. NOEL FREEMAN, B.A. (Cantab.), F.I.A.

[Pp. 191. London: Sir Isaac Pitman and Sons, Ltd. 1948. 8s. 6d. net.]

THE fifth edition of this standard 'text-book of the New Business Department' differs only very slightly from the third edition which was reviewed in *J.I.A.* Vol. LXX, p. 116. There is a corrected statement of the taxation position of annuities-certain, a paragraph referring to the stricter attitude of offices to the problem of war risks, and a clarification of the reference to suicide criticized in the previous review mentioned above. There is, however, no mention of the changes in income-tax abatements made by the Finance Act, 1948, nor of the Industrial Assurance and Friendly Societies Act, 1948, no doubt because the book had to go to press before these measures became law. Also the summary of stamp duty rates in the last chapter does not allow for the increases which became effective from 1 August 1947.

Minor errors which have been noticed are an incorrect value for  $q_{40}(A 1924-29)$  on p. 6, and the omission of 'if' in the Estate Duty condition at the foot of p. 179.

*Rank Correlation Methods.* By MAURICE G. KENDALL, M.A.

[Pp. vii + 160. London: Charles Griffin and Co. Ltd., 42 Drury Lane, 1948. 18s.]

A NOTEWORTHY feature of recent statistical literature has been the appearance of books dealing with special branches of theory and application. Time series, sequential analysis and probit analysis have each been the subject of recent publications. It is not so long since statistics itself was treated only as a special division of mathematics. The appearance of works on special aspects of statistical theory is a welcome sign of the growth and recognition of statistics as an independent discipline.

The present book on rank correlation is an excellent further example of the 'coming-of-age' of statistics. As is to be expected from the author of *The Advanced Theory of Statistics*, the book is notable for the completeness of treatment of its special subject, and for the profusion of numerical examples it contains. It is a book which should certainly be studied by anyone who uses, or is interested in, the particular subject with which it deals.

Rank correlation theory applies to observations which are not measurements in the usual sense, but are observations of order only. It is thus especially useful in cases where measurement is difficult or impossible, but where comparison is performed with relative ease, e.g. the assessment of characters such as beauty or health. The general theory of ordered observations covers a much wider field than rank correlation and it is a matter of some regret that it was not possible to issue a volume covering more of the subject. Nevertheless this cannot detract from the merits of what actually has been produced.

An important feature of the book is the central position it assigns to the coefficient  $\tau$ , based on the number of discrepancies in ranking of two characters, as compared with Spearman's  $\rho$ , the product moment correlation between the ranks. Extensive evidence is adduced to substantiate the superiority of the former

index, and the difficulties of computation of  $\tau$  as compared with  $\rho$  seem to be more apparent than real, being based mainly on unfamiliarity with the methods required.

Coming to the detailed contents of the book, the most noticeable feature is the separation of practical application and mathematical theory into different chapters. The author points out that this was necessary because he desired to satisfy both practical users of rank correlation methods and persons whose main interest is in the theory. It appears that the practical users are assumed to possess little or no knowledge of general statistical theory. This leads to certain extra explanations which could well be omitted if a slight acquaintance with elementary statistical theory could be assumed. In the reviewer's opinion such a general knowledge of statistical theory should be obtained before reading any book on special statistical subjects, and not picked up in the course of reading such a specialist book.

A second valuable feature of the book is the set of tables provided. The tables on the distributions of rank correlation criteria appear for the first time in consolidated and handy form.

There is no point in cataloguing in detail the matters dealt with in the book. For those especially interested in rank correlation theory, everything of importance is there; others are not likely to read the book, but will rely on more general and condensed information available in *The Advanced Theory of Statistics* or elsewhere.

N. L. J.

*Statistical Report on the Health of the Army, 1943-1945.*

[Pp. x+294. H.M. Stationery Office, 1948. £1.]

THIS Report will be found of value primarily to those concerned with army medical administration and to students of medical statistics, whether from the civilian or military standpoint. Certain features, however, are of interest to actuaries, and it has been thought appropriate to restrict this review to a consideration of such features.

The Report has had to be restricted to the triennium 1943-45, as it was found impossible to produce comprehensive medical statistics during the earlier years of the war, when statistical activities in the Army had to be limited to immediate necessities. The analyses and comments furnished cover a wide field, dealing with various aspects of morbidity, hospitalization, discharge and mortality, and providing a fairly detailed subdivision according to the various disabilities responsible for the Army medical wastage. An interesting and concise glossary defines the various statistical terms used in the interpretation of the data. Among the special subjects dealt with are the morbidity and health of troops in overseas areas, medical recategorization and physique (including height and weight sample analyses according to ages at recruitment), medical manpower and accommodation in medical units, and surgical casualties. A separate section is devoted to statistics of psychiatric treatment, indicating the importance of this science in the sphere of modern Army medicine. For those who prefer to absorb their statistics in coloured pictorial form, the Report concludes with some 46 charts illustrating the main features analysed.

In his introduction Prof. Hogben outlines the history of the contribution made by the Royal Army Medical Corps to the development of medical and mortality

statistics. As far back as 1835, two years prior to the creation of the General Register Office, an officer was appointed by the War Office to investigate and report to Parliament on the rates of sickness, mortality and invalidity experienced by the Army. Some of his results were presented in a paper to the (Royal) Statistical Society in 1838, these Army records ranking amongst the earliest British vital statistics. Again, in 1872 Dr Farr in the *35th Annual Report of the Registrar-General* was led to remark that 'the thing to aim at ultimately is a return of the cases of sickness as complete as is now procured from the Army in England'.

In the succeeding period this relatively high statistical standard does not appear to have been maintained, but during the later stages of the recent war the Directorate of Medical (Statistical) Research was set up, and has subsequently been established as a permanent branch of the Directorate of Hygiene. The issue of the present detailed study should go far to regain for the Army its former high reputation amongst those who appreciate the value of medical statistics.

Service in the Forces naturally tends to provide more precise, detailed and comprehensive records, whether of morbidity, hospitalization, wastage, or mortality, than are usually obtainable for civilian occupations, and unique opportunities are thus offered for studying medical problems by statistical methods. For example, the value of civilian hospital statistics is greatly impaired by the absence of the appropriate exposed to risk, a difficulty which should arise far less frequently in data derived from the experience of the Services, though even in this report there seems to be an undue tendency to omit absolute rates and calculate the less informative relative rates. In studying this volume it is, moreover, well to keep in mind the usual difficulties inherent in the appraisal of any occupational morbidity or mortality, e.g. the variations in physical standards required for entry into or retention in any particular occupation, and the occurrence of deaths attributable to that occupation after persons have been either transferred to a lighter occupation or invalidated from work.

In particular, sickness, wastage, or mortality rates derived from military statistics are apt to be vitally affected by any changes or variations in the medical standards adopted for the purpose of hospitalization or discharge—a feature which leads one to doubt the validity or usefulness of many of the comparisons made in this Report between rates for the two sexes.

The actuary will be naturally inclined to turn first to the section in which the aspect of mortality is dealt with. In a rather brief treatment of this subject a comparison is attempted between the army mortality from disease in 1943 and 1944 and the corresponding mortality among the civilian population. A comparison is made between the central death-rates (from disease only) of civilian males in 1939 and 1940, these being the latest years for which the detailed mortality data of the Registrar-General were at that time available. After making due allowance for the adverse effect in 1940 of the recruitment of the healthier lives to the Forces, the 1940 rates are shown to represent an increase of roughly 15% over the 1939 level, such increase being attributed by the author to the stresses of war on the health of the civilian population. On this premise a civilian base line of the 1939 male disease mortality rates with a uniform loading of 15% was adopted for comparison with the corresponding army rates in the war years 1943-44; in the case of women the 1940 civilian rates unadjusted were considered a suitable basis.

It is now fairly widely acknowledged that, contrary to general expectation, the strain of war had no immediate adverse effect on the mortality of the civilian

population. This may be broadly demonstrated by calculating from the Registrar-General's returns the crude mortality rates for the total population (including non-civilians), eliminating all deaths due to violence (including those due to operations of war and road accidents). The following table shows the percentage ratios of crude mortality rates of this type to those for 1939, taken as 100:

Year	Males	Females
1939	100	100
1940	111	109
1941-42	98	95
1943-44	97	95
1945	96	94
1946	97	95

If due account were taken of the increase during the period in the proportion of the population at the older ages, a somewhat greater fall from the pre-war 1939 level than is shown by the above percentages would probably be revealed.

In view of the very severe influenza epidemic which occurred in 1940, the civilian deaths from influenza, bronchitis, and pneumonia being about 40% greater for men and 35% greater for women than in 1939, it is unfortunate that the 1940 level of mortality should have been assumed to be broadly the same as that in 1943-44. If the substantially lower 1943-44 level (based on the above ratios) were substituted for the level used by the author as a base line for comparison with the Army 1943-44 rates, the following percentage ratios of Other ranks/Civilians disease mortality would be obtained:

Age group	Males	Females
Under 22	68	29
22-25	96	17
25-28	101	20
28-31	97	42
31-34	84	44
34-37	68	33
37-40	57	65
40-43	57	55
43-46	59	41

The marked variations in these ratios may to some extent be a reflexion of differences in the medical standards required both at recruitment and discharge, not only as between males and females but also as between the younger and older age groups. In the case of women the degree of medical selection appears to have been far greater than for men; at ages over 37 the numbers of female deaths were probably too small for much reliance to be placed on the mortality rates recorded. Further evidence of this relatively higher standard of medical selection in the case of the A.T.S. is afforded by the following comparison of the average number of days spent each year in hospital or convalescent depot in this country as a result of disease or accidental injury:

	Disease	Accidental Injury	Total
Men	8½	2¼	10¾
Women	5	½	5½

If the time spent in reception stations is also included, the difference between the sexes is decreased, but still remains substantial, the above totals being increased to about 12 days for men and 8 days for women.

In the case of men the tendency for the above percentage ratios to fall with increasing age leads one to infer that medical boards may have been less inclined to take recruits at the older ages, particularly where useful and responsible civilian work was already being performed. A further possible factor influencing this fall in the percentages might be a greater willingness to grant discharges to partially impaired lives at the older ages. At the younger ages the proportion accepted for service was probably substantially higher, and the probability of foreign service greater, so that the effect of the medical selection at these ages appears to have been largely offset by an increased risk of mortality through disease.

S. P. B.

*The Elements of Actuarial Science.* By R. E. UNDERWOOD, M.B.E., F.I.A.

[4th edition, pp. 166 + viii. London: Sir Isaac Pitman and Sons, Ltd., 1948. 10s.]

As the author points out in his preface, this edition is little more than a reprint of the previous one. No doubt that is why he has not accepted the advice of the reviewer of the third edition (*J.I.A.* Vol. LXVII, p. 302) that the modern symbol '!' should be used to denote the factorials.

The book was originally intended as a text-book for the subject of Actuarial Science in the syllabus of the examinations of the Institute of Chartered Accountants. Although the subject was removed from the syllabus some years ago the demand for the book continues to such an extent that a fourth edition has been found necessary. It is evident that students for the examinations of other bodies which include elementary compound interest and elementary life contingencies in their syllabi find the book helpful.

P. F. H.

*Superannuation Schemes.* By GORDON R. HOSKING, F.I.A., Member of the Institute of Taxation, and R. C. B. LANE, M.A., B.Sc., F.I.A., F.S.S.

[Pp. viii + 323. Sweet and Maxwell, Ltd., 1948. £1. 15s. od.]

MANY years have passed since a book on pension funds, designed for the non-actuarial reader, has been published in this country. In view of the wide general interest now being taken in the subject, the timely appearance of this book will be welcome.

In the introductory chapter the authors point out that pension schemes may differ widely among themselves, and that there is a wide range of features to be examined when considering the suitability of a particular scheme in relation to any special conditions affecting the staff to which it is to be applied. One overriding consideration is stressed, viz., that the contributions must be adequate in relation to the benefits provided—a salutary reminder to any who may fail to appreciate how pension charges may grow over a long period.

The thirty-eight chapters of the book deal with schemes, whether privately administered or arranged by means of contracts effected with life assurance companies, the effect of taxation, investment, actuarial aspects, National

Insurance, trust deeds, rules and administration, and transferability of pension rights. The appendix of forty-five pages contains copies of all the important legislation on the subject.

Four chapters are devoted to the types of benefit which may be provided. The first two describe the various methods, familiar to the actuary, by which the scales of pension granted in respect of future service may be determined and the modifications which may be needed in pensions for past service, having regard to the funds available for the purpose. No mention is made here of the age at which or of the conditions under which pensions may be granted. It is surprising to find that ill-health and disability pensions are included at a comparatively late stage in the chapter headed *Benefits in other circumstances* which describes various benefits of a subsidiary nature, following one dealing with benefits on death. Considerable prominence is given in the book to the need for adequate death benefits, and it seems to have been overlooked that the permanent breakdown in the health of the breadwinner might cause greater financial difficulty for the family than his death. The risk of heavy costs arising from the grant of ill-health pensions is perhaps over-emphasized, although in a later chapter dealing with actuarial valuations it is stated that some laxity in permitting ill-health retirements might not have any great financial effect. On a wider view, it is possible that, in some employments, the maintenance of the active staff at a high pitch of physical fitness, involving some extra expense on breakdown pensions, might result in over-all economy.

The distinctive features of privately administered schemes, group life and pensions schemes and endowment assurance schemes and the relative advantages and disadvantages of private schemes and life office schemes are impartially examined.

Except in endowment assurance schemes, the provision made for widows in all these schemes is usually subsidiary and unsatisfactory, and this can best be effected in suitable cases through the establishment of a privately administered widows' pension scheme. The widows' scheme may be entirely separate from the employees' pension scheme, but the authors remark that there are some advantages in having a combined scheme; for example, profits or losses due to variations in the mortality experience tend partially to offset each other in the two sections.

The important place which taxation now takes in the finance of all these schemes is exemplified by the fact that seven useful chapters, including one on Sections 19-23 of the Finance Act, 1947, are devoted to this complex subject. Approved funds enjoy valuable taxation privileges and, in considering the restrictive conditions to which they are subject, it should not be forgotten that the concessions first granted under the Finance Act, 1921, have probably had some influence in encouraging the rapid growth in the number of funds in the last twenty-five years.

The authors then return to general considerations relating to different types of staff, contributory and non-contributory schemes and include a chapter on 'inequities'. It is recognized that equity in this connexion is by no means easily defined and that it has very little meaning as applied to individuals although it may be relevant when considering the respective interests of different groups of persons. It might have been added, however, that, as the employer's contributions are made for the purpose of providing pensions for the staff as a whole, the individual employee in a contributory scheme should have no real cause for complaint if he or his estate eventually receives in one form or another an amount equal to at least the total of his own accumulated contributions to the fund.

Proceeding to the practical steps required to ensure that the objects of the scheme are being fulfilled, there are chapters on investments, actuarial valuations, guarantees by the employer, the trust deed and rules and the adjustment of schemes to allow for pensions under the National Insurance Act. In discussing these adjustments, the authors appear to favour the method of leaving out of account, for the purposes of the fund, the first £100 of the annual salary and wages. It is well-known to actuaries, however, that this simple plan would not be available for application to existing members of a fund if the Trust Deed contained a provision (referred to in the chapter on that subject) that the reductions in contributions by employer and by the employees are to be the equivalent of the reductions in benefits. In a salaried staff, with a rising salary scale, the reduction in contributions would be too great for new entrants and the normal percentage rate of contribution laid down in the scheme would have to be increased—a somewhat paradoxical situation. It is suggested that, once the simple rule is departed from, the adjustments are apt to get complicated and to give rise to misunderstanding. But departure is sometimes inevitable if existing rights are not to be prejudiced, and, as was remarked in the discussion on the paper by W. F. Marples, *The effect of changed economic conditions and State insurance on private pension fund benefits, contributions and valuations*, *J.I.A.* Vol. LXXIV, pp. 212-245, the adjustments need not become unduly complicated.

Any reader who looks for a clear lead in this book for a ready-made scheme, to be applied without further consideration, will look in vain. That is not the aim of the authors. But all who are interested in an existing scheme, or in the establishment of a new scheme, have before them a valuable and comprehensive guide. The authors are careful to point out that, though the final decision on any scheme obviously rests with those responsible for its finance and administration, expert advice should be obtained before that decision is reached. Actuaries who have had the uncongenial task of trying to rectify unsound schemes after the damage has been done will heartily endorse this warning and will welcome this book in the hope that it will lead to an increased appreciation of the sound principles of superannuation finance among all those who are concerned with the subject.

D. A. P.

*Medical Statistics from Graunt to Farr.* By MAJOR GREENWOOD, D.Sc., F.R.C.P., F.R.S.

[Pp. 73. Cambridge University Press, 1948. 6s.]

IT might be thought that actuaries would have little interest in lectures on medical statistics prepared for delivery before a medical audience, and yet we think it would be a pity for any actuary who is interested in the history of his science to miss this book. The name of the author, Major Greenwood, is a sufficient guarantee of the combination of statistical and medical learning shown by the book.

The lectures deal with the early demographers, and the author's main interest is obviously in Graunt, Petty and Halley, to whom more than half the book is devoted. John Graunt, the prosperous City tradesman, who was overcome by worldly misfortune, provided a contrast to his brilliant friend, Sir William Petty,

the precocious cabin boy who became a wealthy physician, Professor of Anatomy and the companion of Charles II. 'Of the two friends, one has left an intellectual monument only; descendants of the other have been famous in English history.'

The work, *Natural and Political Observations upon the Bills of Mortality*, by John Graunt, published in 1662, was an outstanding contribution to the study of statistics, one of the great classics of science. The controversy about the real authorship of Graunt's book is as well known within the circle of those interested in the subject as other more famous controversies of the same kind. Prof. Greenwood is decisively in favour of Graunt on the grounds that his book shows the careful mind of a statistician as opposed to the brilliant but more flighty guesswork of Petty. The comparison is both interesting and satisfying.

Prof. Greenwood states that Halley attempted to construct a *population* table, not a mortality table derived from deaths alone but a simple summation on the assumption that the population was stationary. Being written for a non-mathematical audience, the lectures are not so clear at this point as actuaries would wish and those interested in the subject may refer to the sources mentioned by him.

Within the scope of two lectures Prof. Greenwood is able to deal with many names of interest in the eighteenth century and to bring the story down to the time of Farr. He also finds space for representative Continental demographers. We feel that his references in these sections to Richard Price are somewhat ungenerous, as is, also, his sly dig at eighteenth-century assurance societies. Since scientific life assurance was founded upon a mutual basis it was both necessary to proceed upon a cautious estimate of the mortality experience and justifiable to do so because the profits were to be returned to the policyholders by way of bonus.

The lectures were prepared for delivery in 1940 in the Royal College of Physicians under the terms of the Fitzpatrick trust. Circumstances prevented their delivery at the time; so the author 'evacuated the lectures into statistical territory' and the lectures were printed in *Biometrika*. We hope that actuaries will take notice of the encroachment and accept the author's invitation to linger in times past.

### *Karl Pearson's Early Statistical Papers.*

[Pp. 557 + viii. Cambridge University Press, 1948. 21s.]

THE early papers of Karl Pearson have been out-of-print for many years and unobtainable as offprints or even by purchase of the whole volume of the *Philosophical Transactions* wherein the original paper was published by the Royal Society. In the present volume eleven of the early papers (one was written jointly with Filon) have been reprinted, with a short preface by E. S. Pearson, for the *Biometrika* Trustees. The reprinting is by a photographic process, so the papers are exactly as they originally appeared except that they are now of uniform size. The first paper (1894) gives Karl Pearson's method of dissecting a distribution into two normal curves; the next (1895) deals with homogeneous skew distributions and, in it, appear the first statement of Pearson's system of frequency curves and his splitting of the 'deaths' column of the life table into five frequency curves. The supplementary papers on the system of frequency curves (1901 and 1916) are also reproduced. The third paper in the volume covers regression, correlation, etc. (1896), and the fourth is the joint paper with Filon

(1898) on the probable errors of frequency constants, correlation coefficients, etc. We then come to the paper published in 1898 on the reconstruction of the Stature of Prehistoric Races and no. 8 of the present series gives the paper (1902) on the Mathematical Theory of Errors of Judgment. The papers already mentioned were all published in the *Philosophical Transactions of the Royal Society*. In 1900 Pearson sent the  $\chi^2$  paper to the *Philosophical Magazine*, and that paper is reproduced as no. 6 of the present series, which is completed by two *Drapers' Company Research Memoirs*, dated 1904 and 1905, dealing with the Theory of Contingency and with a general theory of skew correlation and non-linear regression.

The volume gives in one collection a remarkable series of papers that did so much to develop statistical technique and to encourage further development. Naturally the reader will find that in places the papers may seem to call for some corrections, that the accent on some parts of the subject has changed and that many valuable new methods have been developed since the papers were written but he cannot fail to appreciate the great achievement they represent, their historical interest and also their remaining practical value.

W. P. E.