

REVIEWS

The History of The Faculty of Actuaries in Scotland, 1856-1956. By ANDREW RUTHERFORD DAVIDSON, F.F.A., F.I.A.

[Pp. xviii + 291. Published privately for the Faculty of Actuaries.]

A CENTENARY volume is probably not the occasion for a full historical treatment of an institution against the economic and social conditions of the time. The immediate purpose of a centenary volume is to give pleasure to those who join in the celebrations, and the history of the Faculty by Andrew Davidson will undoubtedly fulfil this purpose. The charm of the author's own personality is conveyed in his book and his affection for the Faculty is clearly apparent, as is also his pride in the capital city which is its home.

The general plan of the book is first to describe the foundation and early years of the Faculty at suitable length and then to tell the story of the Faculty mainly in terms of the presidents who have held office from time to time. The author of this kind of book will no doubt be judged by his tact in handling difficult episodes. Davidson burkes none of the difficulties; he treats them with candour but in a way which can give no offence.

Members of the Institute will be especially interested in a comparison of his account of the break between London and Edinburgh with the similar passages in Simmonds's *Institute of Actuaries, 1848-1948*. It may be suggested that Simmonds was trying to recreate the atmosphere, even to read the thoughts of those who lived through the tribulations of the early days of the Institute. He almost came to identify himself with the feelings of members at that time and could see only the black side. A longer vision is needed to believe,

And all is right that seems most wrong.

By way of contrast, Davidson is looking back with the gift of hindsight and the breadth and the charity that come from perspective. He is probably right in saying that the break was inevitable, though it may be doubted whether geography played the decisive part that is suggested since, in other centres, distance has not always led to the setting up of separate institutions. Indeed, as is mentioned on p. 56, Sprague was able to carry the burden of the Presidency of the Institute while being resident in Edinburgh. Thus it seems more probable that it was the numerical importance of the profession in Edinburgh and the distinctive social and cultural life of the Scotch capital that made a separate institution seem desirable.

In this, as in the oecumenical movement, discussions about organic unity are not very fruitful and it seems better to concentrate on the discussion of ways in which mutual co-operation can further the common aims and interests of both bodies. The close and friendly relationships that now exist between the Institute and the Faculty could be exemplified in many ways.

It is interesting to try to discern what was in the minds of the founders from the characteristics of the institutions that they founded. In London, the Institute (see Simmonds, p. 20) had the character of a learned society whose primary purpose was the development of actuarial science; members took part according to their personal abilities, and the professional employment of a

member was not the concern of the Institute. The Faculty (see pp. 226 and 228) seems to have been intended to be more of a professional body whose fellowship was confined to the senior men and whose primary purpose was the professional association of managers of life offices. The academic life of the Faculty was in the care of a separate, junior body—the Actuarial Society of Edinburgh. This division of function seems to bear some likeness to the ideas which were in the minds of those London actuaries who stood aside from the Institute and formed the Actuaries' Club.

A professional association of managers of life offices was not necessarily the same thing as a professional association of actuaries; on p. 73 there is a reference to the difficulty that sprang from the need to define who was an actuary. Time proved to be the solvent of such difficulties.

Some poignancy may be hidden by the urbane narrative (pp. 74-7) of the steps by which the Faculty assumed the functions of the Actuarial Society of Edinburgh in 1900. This change in the Faculty—which must, at the time, have been a difficult one to effect—created that special blend of learned society and professional body which has also been a characteristic of the Institute since the grant of the Charter, in 1884, gave it public recognition.

Perhaps the author is too modest in referring to the contribution of the Faculty to actuarial science, though it may be true that greater contributions were made to actuarial science by those Scots who sought their careers outside Scotland than by those who stayed at home. Two may be specially mentioned. Joshua Milne wrote a practising actuary's text-book which had a profound influence on the profession in the early days. John Finlaison, the first President of the Institute, made great contributions to actuarial science in many fields, and, as he himself said, 'it was to the actuaries of Scotland that the Institute was indebted for its existence'. Happily the flow is an alternating rather than a direct current, and it is of interest to learn that the author considers Lidstone to have been the dominating influence of recent years in the stimulation of the academic interests of members of the Faculty.

Davidson has shown a catholic taste in his choice of the numerous illustrations and a happy precision in quotation. What a party it would be if all the authors, whose words are quoted at the headings of the chapters, could be brought together for the centenary celebrations—Bunyan, Emerson, Darwin, Sidney Smith, Borrow, Christopher Fry, Shakespeare, Scott, Trevelyan, Punch, McLaren!

M. E. O.

Merchant Shipping and the Demands of War. By C. B. A. BEHRENS.

[History of the Second World War. United Kingdom Civil Series. Pp. xix+494. London: H.M.S.O. and Longmans, Green and Co., 1955. 35s.]

MISS BEHRENS, in this latest volume of war history, tells the story of the Merchant Navy and tells it remarkably well. She had access to more documents than any single individual could possibly have seen during the war, and her analysis of these documents is both careful and painstaking. It is perhaps a pity that her brief as a historian was to set down bare facts and statistics linking the pieces which came from many and varied sources. She undoubtedly had all the material for a 'best seller', but her duty let the opportunity pass and her volume will unfortunately become just one of a series and recline on library

shelves. It is even difficult to know whether it will be studied by historians or by statisticians.

Miss Behrens goes back to 1937 when the Headlam Committee was set up by the Committee of Imperial Defence with specific instructions to find out to what extent west coast ports could cope with imports in the event of the closing of the east coast ports by bombing. The report of this Committee, and indeed of every other pre-war investigation, was highly optimistic, and it was not until the spring of 1939 that reorganization at the Ministry of Transport brought some common sense into the calculations and it was shown that it would be impossible to feed London or to meet raw material requirements in the midlands and the east if there were a considerable diversion of shipping.

The Merchant Navy had always been a very independent body, and the only Government department which had any knowledge of its workings was the Mercantile Marine Division of the Board of Trade. It had, however, not been overlooked that Government supervision of shipping would be necessary if war came, and six weeks after its outbreak the Ministry of Shipping was set up to take, in the Mercantile Marine Division, officials from the Ministry of Transport who knew the workings of the ports and a heterogeneous collection of ship-owners and their clerks, civil servants from various departments and a powerful sprinkling of actuaries. The early days of the Ministry were not auspicious and in fact it became the subject of music hall jokes and was even referred to as 'Hitler's secret weapon'!

Miss Behrens shows that any such criticism was quite unjustified and that, in fact, the conduct of merchant shipping was one of the most vital factors in winning the war.

At no time was there sufficient shipping to meet the demands for space, and the whole history is one of compromise between the various parties involved. At the outset the main concern was the supply of imports to the United Kingdom, when the combined requirements of the Ministries of Supply and Food considerably exceeded estimated imports for the first year of 47 million tons. It is a sobering thought to realize that five years later we were haggling with our American allies as to whether they could let us have enough space to bring in 26 million tons or whether we should have to reduce our imports to 24 million.

The same theme continues with the conflict between civil and military demands and the inevitable accusation that the Chiefs of Staff required more tonnage than was really necessary, and wasted what they had got. At one time this caused so much chaos in the Middle East that a senior representative of the Ministry of War Transport—as the Ministry of Shipping became known after amalgamation with the Ministry of Transport in May 1941—was appointed with almost dictatorial powers to co-ordinate military and civil requirements. This appointment was almost immediately successful.

On the entry of the United States into the war after Pearl Harbour it would have been expected that things would ease considerably. The reverse was in fact the case, largely owing to the attitude adopted by the American Service Chiefs, who would brook interference from no authority below the President himself; and even when he intervened at the personal request of the Prime Minister the concessions made were more theoretical than practical.

Apart from the almost personal conflicts of this nature there were constantly arising the more abstract difficulties as to the best employment of the limited shipping available. One of the biggest of these problems was the provision of shipping for the so-called Indian Ocean area which started at Freetown,

embraced Australasia and finished in the Far East. At least 2 million tons was regularly employed in this area and constantly came under criticism because it was not working directly for the United Kingdom or the U.S.A. The bulk of this tonnage could never have been employed on any other work, and in fact the ships on the coal shuttle between South Africa and the Middle East had the greatest difficulty in making their own journeys and could never have faced an Atlantic crossing.

In addition to this regular tonnage it was always necessary to find additional ships to supply fertilizers to the Middle East and to South Africa and even more urgently to supply grain to India. The bogey of famine in India was an ever-present one, and when Burma was lost, and with it its regular supply of rice, the Indians had to accept wheat in lieu. Large shipments were made regularly from Australia, but these periodically had to be supplemented by sailings from the United States. It became a regular feature of the cross trades for the ships supplying India and the Middle East with military equipment to make one or more voyages in the Indian Ocean area before returning to the United Kingdom or U.S.A.

The lay-out of the book is very convenient since it is written in five parts. Part 1 deals with pre-war plans, part 2 covers the period from the outbreak of war to the fall of France, part 3 from the fall of France to Pearl Harbour, part 4 from Pearl Harbour to the defeat of the submarines and part 5 from then to the end of the war. Each part is divided into chapters, and the many appendices appear at the end of the relevant chapter and not at the end of the book. This makes for convenience in reference since there are 70 appendices and 6 maps and diagrams.

It is rather surprising that since the defeat of the submarines marks a particular stage of the war in the mind of Miss Behrens no reference at all is made to this defeat. In fact the paper cover to the book makes the following rather ambiguous statement:

In the popular imagination the shipping shortage was caused because ships were sunk faster than they could be replaced, and was cured by American building and by the defeat of the submarines. This book shows how far these assumptions are from representing the whole truth.

Miss Behrens says nothing to justify this, but it is perhaps a pity that she did not do a little more than give bare statistics of losses and of American shipbuilding. At the height of the submarine war ten good ships a day were sunk on the North Atlantic, and such a rate of loss could not have been borne without the miraculous work of the American shipyards. Whereas in peace-time it might take 12 to 18 months to build a ship of 10,000 dead-weight tons the Americans progressively speeded up production until there was less than a week between laying a keel and launching a new vessel. Admittedly they did not meet the high standards of pre-war British shipbuilding, but there were very few instances where one of the American welded prefabricated ships was lost through faulty construction. Likewise no details are given of the struggle to end the submarine menace, and although no doubt this subject is dealt with in some other part of the war history its omission seems strange in a long volume dealing with merchant shipping.

Much praise is given to the Ministry and there is no doubt that it is well deserved. Reference is frequently made to the ingenuity shown in utilizing shipping space, but the only concrete example given is that of the crating of

wheeled vehicles sent to the operational theatres. One feels that this operation was primarily a victory over the Service planners in persuading them to save space at a cost of considerable delay in unloading. Miss Behrens could have found in the files of the Ministry many ingenious devices which must in aggregate have had substantial effect. As examples, the fast banana boats were regularly used unescorted across the North Atlantic carrying steel and ham. During the build-up for the invasion of Europe new L.S.T.'s built in America were loaded with commercial cargoes. At one period American Service vessels were regularly instructed to fill their oil tanks to capacity before sailing and pump out the surplus oil on arrival at English ports. Human touches of this nature would have added greatly to the pleasure and ease of reading this highly efficient volume.

The foreword pays tribute to two eminent actuaries who controlled the statistical work of the Ministry and who were of great assistance to the author in producing this volume.

E. A. J. H.

Eire: Commission on Emigration and Other Population Problems, 1948-54. Reports.

[Pp. xii+417. The Stationery Office, Dublin. 1955. 12s. 6d.]

THE Reports of which this volume is composed consist of a Majority Report signed by twenty members and two Minority Reports each signed by one member. Of the main signatories, however, no less than fifteen have given their names only subject to reservations or to an explanatory note or addendum. Thus differences of view have been responsible for supplementary statements that occupy almost as much space as the principal document itself. It is clear that questions of population have been the cause of much thought in Eire since the Second World War, and they have perhaps aroused deeper feelings than in Great Britain. Undoubtedly there are important disparities between the demographic situations of the two countries, in spite of a certain similarity in that both had a Commission at roughly the same time and that each Commission was busy for as long as six years on its task.

The superficial appearance of similarity between the Population Commissions of Eire and of Great Britain is enhanced by the fact that their terms of reference contain some identical words and phrases. Both were to consider 'what measures, if any, should be taken in the national interest to influence the future trend' of population, after investigating the causes and consequences of present trends. The Irish terms were, however, the more specific in that they mentioned the 'level' of population and the 'social and economic effects of birth, death, migration and marriage rates'. To see why these additional words were included it is necessary to refer to history. In 1750 there are estimated to have been some three million persons in the whole of Ireland. By 1840 the population had increased to over eight million, and during the intervening ninety years had grown as fast as, or even faster than, that of England. In 1950, however, there were only 4.3 million persons in the country, representing a decrease to about one-half in a century during which the British population had more than doubled. The population of the six counties of Northern Ireland declined but little, and remained at about 1½ million, so that the fall in Eire was even more striking. What were the causes of this remarkable development?

As is well known, emigration is an important factor in Irish life, and this has been so since the eighteenth century; after the great potato famine in 1846-47 the outward movement was intensified. Nevertheless, to quote Prof. Glass,*

emigration was not the sole cause of the continuous and unique fall in the population of Eire after 1841. The responsibility for that fall is shared by the spread of 'moral restraint', by the steady rise in the proportions of men and women who did not marry.

Further, those who marry now do so at a relatively late age. The pattern of bachelorhood and emigration, once formed, has persisted so long as to have become a tradition. Originally very effective in preventing a disastrous increase in population in the nineteenth century, it has continued to operate perhaps too potently in the twentieth.

In discussing the question whether some change is now desirable the Commission do not admit that emigration is selective in removing the bolder spirits from the community—although it may be suspected by the reader of the Report that in truth there is an effect of this kind—but it is held that the prospect that many persons will leave the country discourages plans of economic expansion and thus tends to stifle national development. Apart from Dublin, towns have not grown, and the dispersion of the people throughout the country has changed but little. Investment is on a small scale, and although industry has grown in recent years it could have done so more rapidly. Imports exceed exports in value and external trade has declined; in 1952 the volume of exports was only 76% of that of 1928. A change certainly appears to be necessary in order to revitalize the economic life of the country. Most of the members of the Commission consider, therefore, that it is time that the long-persistent prevalence of emigration and late marriage should end.

In a most interesting concluding chapter, the Report discusses what steps should be taken in order to achieve the desired change, and begins by stating certain philosophic principles: that human life is of supreme worth; that loyalty to the family comes before loyalty to the State; that it is natural to marry and that the propensity to do so should be encouraged; and that the right to migrate ought not to be curtailed. The role of the State should therefore be to encourage the development of resources 'in the belief that they will bring about economic circumstances favourable to the decline of emigration'. Catholic views are evident in the statement of the principle that married couples may plan their families

if their decisions are based on morally good motives and their actions and methods of control do not violate the moral precepts of the natural law,

but that birth control should not mean

arranging to have a small family... from selfish or purely materialistic motives which are morally indefensible, or by the use of contraceptives or artificial means, or by other methods which are contrary to the natural law.

As fertility within marriage has remained relatively high in Eire, apparently in virtue of a public acceptance of the attitude towards birth control expressed in the Commission's Report, a reduction in average age at marriage should have the effect of increasing the rate of population growth. Various steps have therefore been recommended for encouraging early marriage—such as the removal

* *Introduction to Malthus* (1953). Watts and Co.

of the bar to married women in some spheres of employment, the promotion of housing schemes and the framing of a suitable educational policy for the schools—and also for the improvement of the national statistics of marriage and fertility. These steps may not seem to the reader to be likely to bring about a radical or sudden change, and it may be questioned whether enough has been recommended to prevent matters continuing much as in the past. It is, however, the Commission's hope that general economic development will also favour earlier marriage. In a vigorously written reservation the Rev. A. A. Luce has referred to the fact that in his lifetime 'public men, leaders of thought, great communities and whole nations have changed their minds on the issue' of birth control, has deplored the fact that no evidence on the subject was placed before the Commission, and has suggested that the 'taboo' on contraception is a contributory cause of late ages at marriage. In connexion with this taboo it will be remembered that the British Royal Commission Report was at first a banned book in Eire.

It is interesting—but hardly surprising in current world conditions—to note that individual reservations have been expressed concerning the desirability of larger families and of a larger national population.

Analytical work of the high order of that carried out by the Statistics Committee and staff of the British Royal Commission is not to be found in the Irish Report. Even if the circumstances of Eire had called for such studies they would hardly have been possible having regard to the limited data that are available. The recommendations in the Report relating to improvements in statistical records of marriages and births include the collection of details of age at marriage and of the mother's age, date of marriage and number of children whenever a birth is registered. These should permit a more effective discussion of fertility trends in the future. It seems likely that the Report's clear statement of the present situation and its recommendations for more extensive statistical analysis of population are associated, at least in part, with the presence of an actuary—Mr W. A. Honohan—on the Commission. It is gratifying to note this further manifestation of actuarial influence in demographic affairs.

P. R. C.

Numerical Analysis. By Z. KOPAL.

[Pp. xiv + 556. London: Chapman and Hall Ltd. 1955. 63s.]

THIS book is based on courses given by the author at the Massachusetts Institute of Technology and covers very adequately most of the commonly used aspects of numerical analysis such as interpolation, numerical differentiation and quadrature, differential equations and boundary value problems. The standard of mathematics assumed roughly corresponds with that required for the entrance examination of the Institute of Actuaries. There are numerous examples in the text and they add considerably to the value of the book because they are usually very carefully worked out so that the reader can go through them stage by stage, checking at each stage.

The chapter on interpolation will be of great interest to actuaries. Proofs of the various interpolation formulae are obtained from the Lagrangian form of formula where $n+1$ points are used in order to fix a polynomial of order n . The proofs using operational methods are given in an appendix. There is a good discussion of inverse interpolation and also of the effect of errors on a table of differences. Some treatment of the problems of interpolation in a two-way table

would be of great value at this point, as would a little further guidance on what interpolation formula to use under any particular set of conditions. The succeeding chapters deal with numerical differentiation and quadrature. The latter is contained in two chapters of some 200 pages dealing also with the integration of differential equations; and, although an appendix contains a list of the various coefficients that apply to different types of quadrature formulae, a résumé of the more common formulae used in practice would have been a useful addition.

A feature of the book is the brief bibliographical notes that are given at the end of each chapter under various subheadings, which should enable anyone desiring to pursue some topic further to get a good start. There are also a large number of examples for the reader to work that vary enormously in difficulty. The whole book lays emphasis on the ideas appropriate to single variables, and this is a slight drawback. Thus the absence of even a brief discussion on partial differential equations is to be regretted. To make the book self-contained would also require such topics as the inversion of matrices to be covered and the tables given in the appendices would require some extensions and additions. These points in no way diminish the value of this book which is extremely thorough and very readable. Anyone concerned with numerical analysis should find it a very useful work of reference and guide for much practical computational work.

P. G. M.

Health in Industry. Published on behalf of London Transport Executive.

[Pp. 177. London: Butterworth and Co. Ltd., 1956. 35s.]

THIS book contains very little reading matter, since essentially it is a set of statistical tables relating to the sickness experience of London Transport. Its title is appropriate only in the sense that London Transport is a large segment of a large transport industry, that the methods of practical statistical organization which have been used to derive sickness statistics in London Transport might, given the will, be replicated in other segments of industry, and that the experience of London Transport might, under certain conditions, be used as a standard of comparison for other sickness experiences.

The statistical methods have been fully documented, on a previous occasion, in a paper by Lloyd & Spratling (*J.I.A.* 77, 196), and it is gratifying to note that it has now been possible to furnish one of the statistics called for in the discussion of that paper, viz. the distribution of spells of sickness by duration. Textual matter is limited to a statement of methodology and notes with regard to conditions of sick pay and other reservations applying to particular groups of staff. These notes are concise but clear. One is left in no doubt as to what the rates represent and the method by which they have been derived. In this respect alone the volume is exemplary.

For the rest the reader is given a mine of information and is left to his own extractive devices, not without some valuable help from diagrammatic representation. (This official reticence will of course be well understood by those with experience of staff administration and the ability of staff representatives to turn seemingly innocuous statements to their own advantage.) The scope of the statistics may perhaps be illustrated by posing a question which must have arisen in the minds of many—since bus conductors come into contact with the

public much more than drivers, do they suffer more infection, particularly of the common cold? The following figures (limited to absences of 4 days or more) suggest that they do, but the excess is not as large as might be expected.

Central bus staff, 1949-52
Common cold—Average annual duration of sickness absence
and average annual inception rates
Absences of 4 days or more

Age	Conductors		Drivers	
	Days per person	Spells per person	Days per person	Spells per person
Under 25	·270	·033	—	—
25-29	·149	·017	·086	·012
30-34	·124	·014	·077	·009
35-39	·126	·013	·086	·010
40-44	·124	·014	·096	·008
45-49	·165	·017	·170	·012
50-54	·286	·022	·172	·014
55-59	·358	·024	·268	·016
60-64	·489	·029	·250	·015
65+	[·359]	[·025]	[·167]	[·014]

This is not the whole story, since there are obviously different selective criteria operating for the two grades of staff and there may be correlation between different disease groups. There is still a great deal of study to be done, but at least a large chapter of the story has now been written.

B. B.

The Biology of Senescence. By ALEX COMFORT.

[Pp. xiii + 257. London: Routledge and Kegan Paul, 1956. 25s.]

THIS book is a compilation of existing knowledge of age processes in man and animals. It is both a reference work on the longevity of animals and an array of information pointing to lines of research in attacking the problem of old age. Senescence is defined simply as 'an increasing probability of death with increasing chronological age'... 'the study of senescence is the study of the group of processes, different in different organisms, which lead to this increase in vulnerability'.

In dealing with this concept the author naturally finds himself dealing with actuarial methods of measurement, and his treatment is the less effective as the result of his failure to use the conventional notation and relationships of the mortality table. Moreover, though the book is rich in illustration of survival curves there is very little reference to the (admittedly empirical) work of actuaries in this field.

Nevertheless, this is a minor grumble, for the author has brought together a mass of information of absorbing interest; not least to actuaries who will find much to illuminate thought about mortality changes with age.

The author examines the principal features of senescence (what Medawar (1945)* has referred to as 'development, looked at from the other end of life')—declining growth rate, reproductive decline, and metabolic decline—and different

* Medawar, P. B. (1945). *Mod. Quart.* 1, 30.

forms of causation—mechanical wear, exhaustion of irreplenishable reserves and failure of organization. He introduces the intriguing concept of senescence as the behaviour of a living system after the exhaustion of the evolutionary programme laid down by the selective equilibrium.

The reader will find that 'the longevity of tortoises is one of the few popular beliefs about animal life span which is correct—152 years having been recorded'. Claims of several hundred years for the carp are still made but without seriously acceptable records; the whale has a life span of a mere 30–50 years.

The author examines the evidence for inheritance of longevity and Dublin (1949)* is stated to have concluded that 'the evidence from actuarial studies is heavily vitiated by all kinds of environmental influences'. Sex differences and extreme variations between individuals are also discussed. There is a good review of contemporary experimental work. The importance is underlined of pursuing the study of every animal into the senile period and of the conduct of critical experiments to test hypotheses. Dr Comfort speaks of 'a reliable test of senescence which correlates with decline of resistance, does not kill the individual animal, and can be related to actuarial senescence by an intelligible process of reasoning'. It is not always clear what the author means by 'actuarial', but it is clear from this stimulating and readable book that actuarial technique may have a useful part to play in this field of service and that actuaries might benefit from closer contact with the biologists.

B. B.

* Dublin, L. I., Lotka, A. J. and Spiegelman, M. (1949). *Length of Life*. New York. Ronald Press Co.