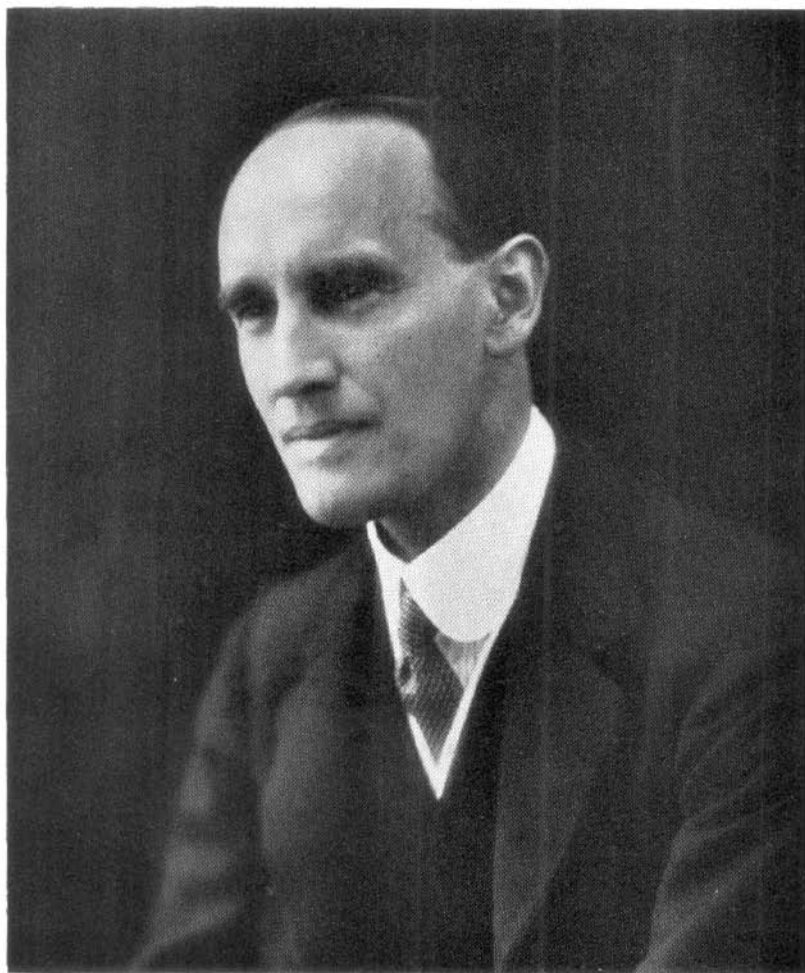




GEORGE JAMES LIDSTONE

MEMOIRS

GEORGE JAMES LIDSTONE

THERE can be few members of the profession who did not feel a sense of loss on learning of the death of G. J. Lidstone on 12 May 1952.

Lidstone was born on 11 December 1870 in London and was one of six children of Thompson Lidstone, who came of a West Country family. Two of his elder brothers and an elder sister died in early middle age, one brother died in childhood, and an elder sister lived to be ninety-four. His mother was Eliza Munnings, and so he was a somewhat distant cousin of the artist who was recently President of the Royal Academy. It may be mentioned that a great-uncle of Lidstone, Captain Josiah Thompson, R.N., was commended for a rather good cutting-out expedition at Arcachon during the Napoleonic Wars. Thompson's sword used to hang in one of Lidstone's rooms.

Lidstone was educated at Kingsland Birkbeck School, where he became 'captain' of the school and received the Runtz Gold Medal for being the most brilliant scholar in his last year at school. The Headmaster's brother, Sir John Runtz, was Chairman of the British Empire Life Office (now part of the Phoenix) and Lidstone went to that office on leaving school. He passed his first examination at the Institute of Actuaries in 1887, and became a Fellow in 1892 when he was only twenty-one. Three years earlier a letter from him on assurances with return of premiums was published in *J.I.A.*

He went to the Alliance Assurance Company in 1893, was appointed Assistant Actuary in 1894, and promoted in 1902 to the position of Actuary, a post which he held until 1905. While he was at the Alliance he sent to the Institute a series of papers that made his name. The first was on using the graphic method of graduation for a small experience by means of comparison with a standard life table, and the next was on the distribution of surplus with special reference to Sprague's contribution method. This was a practical discussion of the methods then in use, and I can well remember how helpful I found it when I was studying valuation for my examination. The next paper—there were in fact two papers—followed a couple of years later, and described what is now known as 'Lidstone's *Z*-method'. To appreciate its value it is well to remember that, at the time it was written, most actuaries valued endowment assurances by grouping them according to unexpired term and using for the group an annuity based on the arithmetical average of the attained ages (not of the maturity ages!). Lidstone discovered that weighting the ages in geometrical progression gave a much closer approximation, and his method has been used ever since by many assurance companies with excellent results. I should not myself use it in valuation work, but my personal preference for either greater 'accuracy' or another kind of approximation does not blind me to the usefulness of the method. The underlying ideas have been used in recent years by continental writers who have drawn inspiration from Lidstone's work. Both the papers and subsequent notes on the same subject are expressed in his clear, convincing style and contain points of interest in addition to the approximate method of valuation.

There were actuarial notes on other subjects and one, at any rate, needs special mention; it gave the approximation $P_{x:\overline{y}|n} \doteq P_{x:\overline{n}|} + P_{y:\overline{n}|} - P_{\overline{n}|}$ which he

evolved by a pretty piece of reasoning. Today the result seems fairly obvious, but it only became so when Lidstone sent it to *J.I.A.* in 1897.

Not long before he left the Alliance he submitted to the Institute the paper on *Changes in Pure Premium Policy-values* (*J.I.A.* xxxix, 209) and he confessed publicly about twenty-five years later that he considered it 'his best piece of work'. If Lidstone had been a proud man, instead of one of the humblest, he might properly have been very proud of it—there is nothing else on that subject to touch it, and one wonders if any paper on any actuarial subject could easily be placed as its superior. I recall the thrill of surprise with which I first read it; a text-book subject came to life as if touched by magic.

But other things were happening during those days at the Alliance: Lidstone helped to found, with a few others, the Gallio Club; he had become a member of the Council of the Institute and had been elected to the Actuaries' Club; and, most important of all, he had married in 1901 Florence Mary, eldest daughter of Robert Gay. She counted much to Lidstone, helped him in very many ways and endeared herself to his friends. To their regret there was no child of the marriage.

In 1905 Lidstone became Actuary and Secretary to the Equitable, where an appreciable amount of 'tidying up' was necessary, and during the eight years he spent there he not only did much for the office but produced a number of actuarial notes together with the papers on the rationale of the summation method of graduation and on approximating to last-survivor annuities. The paper on graduation was one of his best; it appeared in two parts (*J.I.A.* xli, 348 and xlii, 106) and showed how well Lidstone could deal with such a subject and how wisely he could interpret the results. Though many writers have since written about that method of graduation, the paper covers all that it is essential for any practising actuary to know of the subject. The paper on last-survivor annuities (*J.I.A.* xlvi, 1) gave the required annuity value in the form $\alpha + C_1 \times 1st$ correction $+ C_2 \times 2nd$ correction, where α represents the annuity value on lives of equal age—the arithmetical average of the actual ages—and C_1 and C_2 depend only on the actual disparities of age so that they are the same for all mortality tables and rates of interest. It was really an ingenious interpolation, set out so that it would reduce the amount of tabulation necessary; but though Fraser, Todhunter, A. E. King and Lidstone added notes subsequently the method has not, one regrets to say, yet been used in practical tabulation.

In addition to all this, Lidstone found time in 1908 and 1909 to see through the Press G. F. Hardy's Lectures, given in 1904-05, on *The Theory of the Construction of Tables of Mortality*. I think I am right in saying that had it not been for Lidstone those delightful lectures would not have been published; but though it must have been a rather hard task, I am sure it was a labour of love from Lidstone's point of view.

Towards the end of his time at the Equitable Lidstone was appointed, in 1912, a member of the Actuarial Advisory Committee of the National Health Insurance Joint Committee and served on it until 1914.

In 1913 he left London on being appointed Manager and Actuary to the Scottish Widows' Fund. He managed the office successfully for seventeen years and was afterwards a director till 1946. He was also a director of the Royal Bank of Scotland and of the Scottish Consolidated Trust. He was elected a Fellow of the Faculty of Actuaries after he had been a few years in Scotland, and was President from 1924 to 1926. In October 1929 came what must have been one of the proudest moments of his life, when the Institute and Faculty

combined in the presentation to him of a gold medal 'In recognition of his unique services to Actuarial Science'. Everyone must feel that the remarks on his work made on that occasion by the two Presidents were exactly in the form that Lidstone would like and his short speech of thanks, with its reference to the way in which he jotted down his ideas, was typical of him.

He was given the honorary degree of LL.D. by Edinburgh University—an honour which, I know, pleased him greatly—and was a Fellow of the Royal Society of Edinburgh. He had been a Fellow of the Actuarial Society of America for many years and was also a corresponding member of the Association of Swiss Actuaries.

During the war he served as a member of the General Claims Tribunal from 1939 to 1942. This Tribunal was set up under the Compensation (Defence) Act, 1939, and consisted mainly of Judges and eminent Counsel; but it included also a banker and an accountant, both leading men in their respective professions. Lidstone, who was appointed to this task by the Lord Chancellor, found the work interesting and the associations pleasant, and regretted when his failing sight compelled him to resign.

Under Scots law a domiciled Scotsman cannot will away all his property if he leaves a wife or child surviving, and if such survivors insist on their legal rights 'Equitable Compensation Schemes' are devised to secure fairness between beneficiaries whose benefits have to be reduced. Lidstone wrote a paper for the Faculty (*T.F.A.* xvi, 29-65) giving guidance to actuaries called in to advise on such schemes. Apart from this he wrote no long paper after leaving London but published in actuarial journals (*T.F.A.* now shared with *J.I.A.*) notes on various actuarial subjects, on interpolation, summation etc. His last contribution was historical, on the origin of the card system. He also wrote a few mathematical papers for other journals. All his work of this kind, and there is much of it, is uncommonly well done; he took great trouble to express clearly everything he wrote and one felt that his algebraic work gave pleasure both to the author and his readers. In a few cases the papers were written jointly. Every reader has his own preferences; among Lidstone's later work I think I enjoyed most the two papers on double and triple geometric laws of mortality (*J.I.A.* LXVI, 413; LXVIII, 535) and the note on Poisson (*J.I.A.* LXXI, 284).

Lidstone's work was so carefully considered by him that he made very few slips; others may not have agreed with all his opinions, but his only effort that was, I think, in error was his note on the calculation of the present value of a series of payments—certain when the reproductive rate of interest differs from the remunerative rate (*J.I.A.* XXXIII, 412). George King and Todhunter both accepted and used his formula, and it was only withdrawn from Todhunter's book in the 1915 edition when it was noticed that in certain circumstances the application of the formula implied that deficits in the amount available for interest were accumulated at the reproductive rate. It was so tantalizingly neat that there is plenty of excuse for everyone. As Lidstone mentioned many years later, he had not discussed in his note its limits of practical use; so perhaps it is a little severe to say he was in error. There was another case when I think he was wrong, but it may well be regarded as merely a matter of opinion; it was in his mild controversy with Steffensen, in *J.I.A.* LXI, about the limiting age and about equal policy values. His arguments on that occasion seem to me to lack his penetrating vision.

There were three other contributions; his Presidential Address to the Faculty, which touches on many things with some pleasing and out-of-the-way quotations,

and his memoirs of G. F. Hardy, Phelps and Hutton. Lidstone felt that he owed much in his student days to Hardy's inspiring lectures and encouragement, and they became close friends. The younger man's admiration for Hardy was great; his memoir shows this, and leaves the reader with the feeling that in writing of Hardy, Lidstone 'honoured his memory on this side idolatry'. To those who knew both men this is what the memoir should have conveyed. The tributes to Phelps and Hutton displayed Lidstone's affection for contemporaries, and this was further in evidence when, in 1944, the chairs and table which Phelps gave to the Institute in 1932 were destroyed; Lidstone decided to replace them for the sake of the Institute and in memory of his old friend.

During Lidstone's Presidency of the Faculty the Clauson Committee was considering the Assurance Companies Act, and the Institute and the Life Offices Association recommended that the lists of whole life assurances etc. in the Fifth Schedule of the 1909 Act should be discontinued. Unfortunately the Faculty disagreed; Lidstone was definitely against the suggestion. Anyone who is interested can read the evidence; we were told that with the Fifth Schedule alternative valuations were possible, and we countered the argument with the so-called *n*-ages method. As there was conflicting actuarial evidence, and as the Industrial Assurance Commissioner and the Government Actuary were in favour of the retention of the Schedule, no change was recommended. I did my best to persuade and convince Lidstone but he disliked the change too much to give me any real chance of success. Lidstone's attitude of sticking to something to which he was accustomed held in some other cases; thus he did not like the idea of publishing a bonus reserve valuation, though I had found when I succeeded him at the Equitable that he had arranged the details for such a valuation, had prepared tables based on the mortality experience of the Equitable to facilitate the work, and had used the bonus reserve valuation in order to be sure the sum carried forward in excess of a $2\frac{1}{2}\%$ net premium valuation was adequate for the bonus system. I think he was afraid that any decrease in published information, as we had suggested to the Clauson Committee, or any considerable change in published valuations might lead to fraud or misunderstanding. I did not and do not agree, but perhaps he was right. In any case these things are matters of opinion.

At the end of his life, Lidstone had been a F.I.A. longer than any other living Fellow. I know how touched he was when on his 80th birthday Penman presented to him, on behalf of the Institute, an illuminated address, and this, and the gift of one of the Phelps chairs that had survived, were events which, with the Gold Medal, are delightful for his friends to remember. With typical forethought he expressed a wish that this chair should be returned to the Institute after his death.

There are many members of the Institute who never saw Lidstone and will want to know what manner of man he was. He was dark, with a slightly sallow complexion and clear cut features; he was above medium height, but thin and erect and so appeared taller than he actually was; he was always carefully dressed; he had a clear, pleasant voice. He was not exactly handsome, but when he came into a room one looked at him more than once. His recreations were lawn tennis and music.

In common with many others I owe a lot to Lidstone; but it must be confessed that some people thought him rather pernickety in business, in spite of his successful business career, and there was a definite idea, especially in his London days, that he was not easy to get on with and was unpopular with his staff. It

did not seem to occur to such critics that Lidstone was intensely shy and could not help retiring into his shell, that it was well-nigh impossible for him to wear his heart on his sleeve, and that he was by nature one of those who wanted to go into every detail to be sure he was doing what was right. He told me, more than once, that he found it hard to decide quickly in business because he saw so many points he wanted to clear up. It was no doubt trying at times to his business friends when he would 'contend for the shade of a word, a thing not seen with the eyes', but it was that quality of complete thoroughness that made his actuarial work so valuable. Another characteristic associated, I think, with this was that he found it difficult to appreciate an alternative view on a subject on which he had himself worked. A trivial example will suffice; in his early days he was concerned with the 1863-93 mortality experience and he thought, rightly, that for 'select' mortality the policy-year method was ideal; he never felt at home with the census method. (Incidentally, one should not overlook his short note on the treatment of incomplete years of exposure, *J.I.A.* XXXI, 304.) Perhaps the Steffensen controversy is another example. The explanation of this kind of difficulty was, I feel sure, that when he was working on anything he concentrated so intensely that, having convinced himself that a method should lead to good results, he had cut out other approaches, not of malice aforethought, but because he had got it all so clearly in his head that from his point of view the 'incident was closed'—there was no need to look elsewhere. Many investigators have shown that characteristic and, after all, such concentration produces excellent work. Those who did not know Lidstone well may find it hard to appreciate how painfully shy he was; but, perhaps, shyness explains why he was never a tutor, seldom an examiner and why, though he contributed to discussions and could speak well, he often made excuse for not speaking and sent a written contribution. He was a judge of himself and just as, though he could not wear his heart on his sleeve, he wrote the most charmingly friendly letters, so also, I think, he trusted himself on paper rather than verbally in discussion.

These, he knew, were defects and as the years went by he largely succeeded in overcoming them, but I like to think that such human weaknesses drew Lidstone still more closely to his intimate friends and to those younger men whom he had helped with encouragement and advice. And though he and I did not always see eye to eye on things actuarial or in business it did not matter; our friendship ripened over our differences.

It is with admiration that the profession, for which he had an almost passionate love, will regard his work; but highly though I regard it, I find myself thinking, as I look back on a long friendship, more of his many kindnesses to me, of his understanding when we differed, of his really charming letters, of happy hours spent with him and his wife, and also, alas! of his loneliness without her after her death, and of his blindness and failing health, which he disguised so well when he gave me his affectionate welcome on my occasional visits. And though I cannot wish him back, I know that I shall miss him all my days. W.P.E.

HORACE RICHARDSON BASSFORD

THE news of the death of Horace Bassford on 12 March 1952 came as a great shock to his many friends in England and in actuarial circles throughout the world.

Horace Richardson Bassford was born on 17 December 1889 and was educated at Trinity Chapel School, New York City, and Trinity College, Hartford, Connecticut, from which he graduated in 1910. He subsequently studied electrical engineering at Brooklyn Polytechnic Institute for four years, during which period he was for a year associated with the Thomas A. Edison Laboratory in West Orange, New Jersey.

It was not until 1915 that he decided to enter actuarial work, when he joined the Metropolitan Life Insurance Company (of New York) in whose service he remained until the date of his death, apart from a period in the armed forces in the first World War. Shortly before his qualification as a Fellow of the Actuarial Society of America in 1920 he was placed in charge of the group life and health section of the Metropolitan's Actuarial Division. He was appointed Assistant Actuary in 1923, Actuary in 1936 and Vice-President and Chief Actuary in 1944, which post he held at the time of his death.

He was an indefatigable worker for the actuarial profession. He served as chairman of many important committees of the Actuarial Society of America within a comparatively short period after his qualification. He was elected to the Council in 1931 and was re-elected at every opportunity without exception until he became President in 1947. During his presidency the negotiations for the merger of the Actuarial Society of America and the American Institute of Actuaries into the Society of Actuaries were finally concluded, and his ability as a chairman contributed in no small measure to the solution of the many problems with a minimum of tension.

His many contributions to actuarial societies and to International Congresses over a wide range of subjects, mostly from the underwriting standpoint, showed that he was a sound practical actuary with a commonsense, down-to-earth outlook.

He became known to a wide circle of actuaries at the Centenary Assembly in 1948, which he attended in his official capacity as President of the Actuarial Society of America. His speech in reply to the toast of the guests, the last official speech at the last function of the Centenary, was a typical example of his simplicity, his sincerity and his sense of fun. Following the Centenary he was elected a Fellow of the Institute, an honour which he greatly prized.

His merit as an actuary was further recognized internationally by his appointment as a corresponding member of the Institute of Spanish Actuaries. Shortly after his death news was received of his election as a corresponding member of the Institute of French Actuaries.

That he was anxious to play his part and accept the responsibility for the honours conferred upon him is exemplified by the request he made just before his death for copies of Institute papers to be sent to him in advance of the meetings so that he might forward written contributions to the discussions.

As a man he was thorough, vigorous, positive and forceful, with a friendliness and good humour that was most disarming. The name Jerry by which he was universally known seemed so well to suit him that it became natural to use that name and always to think of him as Jerry.

It is for his human characteristics that he will be remembered best: his liking for people, his sense of humour, his kindness, his tolerance, his sincerity and, above all, the simplicity which made it impossible to believe that he held one of the highest posts in the largest insurance company in the world and had reached the top of his profession nationally and internationally.

C.F.W.

DUNCAN CUMMING FRASER

ACTUARIES, particularly those of an older generation, will have learned with regret of the death on 18 March 1952 of Duncan Cumming Fraser, in his 88th year.

A man of great charm of manner, combined with the highest intellectual force, Duncan Fraser will be remembered by many actuaries practising today for characteristic acts of personal courtesy and friendliness to them as young men, as well as for occasions when his help has been readily available in the fullest measure. He possessed firmness and integrity of character in the highest degree, and this stamped unmistakably all the work of one who has well served his age and generation, and whose passing leaves a gap not easily filled.

He showed early promise of outstanding ability, whilst still at school, by obtaining first prize in England and Wales for general proficiency in the mid-summer examination of the College of Preceptors in 1879 at the age of 15. Subsequently, he was 18th Wrangler at Cambridge in the Mathematical Tripos in 1885 and, after proceeding to M.A., joined the staff of the Royal Insurance Company at its Head Office in Liverpool in the following year. He became the Actuary of the Company two years later, a position which he held until his retirement in 1926, a period of thirty-eight years.

His professional activities in a wider sphere were such that he became one of the best known actuaries of his time. In 1908 he was appointed to the Departmental Committee on Railway Superannuation Funds which reported in 1910, and his later reputation and standing as a consulting actuary largely derived from the important part which he took in the work of this Committee. In the drafting of the scheme which eventually became the National Insurance Act, 1911, the clauses relating to seamen were based on his Report to the Steamship Owners' Association, which was accepted by the Shipowners, the Seamen and the Government; and when the scheme came into operation in 1912 he was appointed a member of the Actuarial Advisory Committee, on which he served for the period 1912-15. He subsequently served on the Departmental Committee on the Superannuation of School Teachers which reported in 1923. In 1924 he was asked to advise the Conservative Shadow Cabinet with regard to a scheme of widows', orphans' and old age pensions, preliminary to the enactment of the Widows', Orphans' and Old Age Contributory Pensions Act in the following year. As recently as 1944 he served on the Joint Superannuation Sub-Committee of the Nurses' and Midwives' Salaries Committee, England and Scotland.

During the period of his service with the Royal he devoted a good deal of care and attention to matters concerning staff welfare. He is remembered by the staff as the originator of an ingenious (and, at that time, novel) scheme for a Benevolent Association aimed at providing, by a system of grants, for the costs incurred by members of the staff on account of their sickness or that of their wives and dependants. Today, nearly fifty years later, the Association is still functioning successfully and has proved to be of the greatest service to the staff. Just before his retirement, he further interested himself on behalf of the staff when he secured approval for a contributory Widows' Pension Fund, then an unusual feature of staff benefits.

He was the Honorary Actuary of the *Titanic*, *Lusitania*, and *Empress of Ireland* Relief Funds from their inception, and later acted as the first Honorary Actuary

to the National Disasters Relief Fund until 1938. He also served in a similar capacity for the Hulton and Gresford Colliery Disaster Funds.

After his retirement from life assurance work in 1926, he built up a large private practice as a consulting actuary, and to this task he devoted the greater part of his energies, specializing almost exclusively in pension fund work. It was not until fourteen years later that he took a younger actuary into partnership and commenced by stages to relieve himself of daily office work. This process of gradual retirement was not completed until three years ago.

Throughout his business life he showed that he possessed to a remarkable degree a combination of shrewd, practical common sense with acute powers of theoretical analysis. Of particular value was his ability to present technical arguments and considerations in terms that could be readily appreciated by business men.

He was always interested in actuarial students and did much to help them. In 1908 he asked a group of young students in Liverpool to tell him which part of the work for the examinations of the Institute of Actuaries presented difficulty due to the fact that the reading available at that time was, perhaps, not altogether adequate; and the general subject chosen was that of interpolation formulae, and central difference formulae in particular. In his desire to help he took an interest in this subject and gave a short course of lectures on it. These he ultimately worked up into his well-known note on the graphical delineation of interpolation formulae, which appeared in the *Journal* (XLIII, 235) in 1909, developing his 'beehive' and 'lozenge' diagrams, while some further notes appeared in 1916 (*J.I.A.* L, 15). Students who heard the lectures still remember those brilliant and elegant studies, and it is perhaps fitting that his work in finite differences, which ultimately made him known in circles outside the actuarial profession, both at home and overseas, was the outcome of a generous impulse to help some very junior students.

To the end of his life he maintained an active interest in finite differences, being sustained in this interest by his opinion that it is especially incumbent upon actuaries to develop this branch of mathematics. Accordingly, and in the endeavour to understand the subject more thoroughly himself, he engaged from 1917 onwards in a considerable amount of research into the seventeenth- and eighteenth-century Latin works left by such English mathematical pioneers in this field as Briggs, Newton and Waring. The principal published outcome of this research appeared in the *Journal* at intervals between 1918 and 1927, and was reprinted at his expense in a slender volume entitled *Newton's Interpolation Formulas*, of which a copy was given to each of the members of the Eighth International Congress of Actuaries which met in London in the last-mentioned year. That year was the bi-centenary of the death of Newton, and the occasion was marked by the publication of a book entitled *Newton 1727-1927* by the Mathematical Association, to which he contributed a paper summarizing and extending the notes which had already appeared in the *Journal*.

Competent authorities consider that an unpublished memorandum on *Briggs's Method of Interpolation*—a typescript copy of which was found amongst his papers—is as important as any of his published notes on the corresponding work of Newton. Fraser's modesty and his severe self-criticism, however, stood in the way of the publication, during his lifetime, of the Briggs memorandum.

Apart from the notes on finite differences and interpolation formulae, to which reference has already been made, he contributed to the *Journal* a considerable number of notes on other subjects. The first of these, on a method of

finding the yield on stocks sold at a premium, appeared as an appendix to a paper by Joseph Burn in 1899, whilst the last, on the Gompertz Table, appeared in 1947. Other subjects covered in these notes included the use of $O^{[M]}$ select premiums for valuation purposes (1905), the force of mortality (1909), the curve of deaths (1911), Lidstone's method of approximation for the values of joint-life and last-survivor annuities (1912), the mortality of annuitants (1924), stationary and uniformly progressive insurance funds (1926), and graduation (1936).

He read a paper to the Institute in 1904 (*J.I.A.* xxxviii, 385) on methods of grouping whole life assurances for valuation—which was for many years a most valuable standard of reference—and one to the Faculty in 1934 (*T.F.A.* xv, 141) on simple summations and summations of products.

His tall, spare figure was seldom absent from Institute meetings in the Staple Inn Hall during the period of forty-five years which preceded its destruction in 1944, and many will remember his frequent and fruitful contributions to the discussions.

In 1941 he had the misfortune to lose, by enemy action, almost the whole of his mathematical and actuarial books and papers, both at his home and at his office. A few months later, by a happy gesture which he very much appreciated, the members of the Council of the Institute and of the Actuaries' Club met together to present to him, as a mark of esteem, copies of many of the books which he had lost.

For a large part of the period from 1904 to 1935 he was on the Council of the Institute, serving also on the Board of Examiners during some of the earlier years of that period, and as a Vice-President and Joint Editor of the *Journal* during some of the later years. In the last-mentioned capacity he was invariably patient, encouraging, and constructively helpful, while maintaining a very high standard.

He had been a Fellow of the Institute since 1897, and a member of the Actuaries' Club since 1909, and he was also a member of the Mathematical Association.

A life-long Liberal of the strongest convictions, he did not at any time take an active part in political affairs. He was a leading and highly respected member of the Trinity Presbyterian Church at Claughton, Birkenhead, and for nearly half a century his wise counsel in Church matters was held in the highest regard. During the 'blitz' period 1940-41 on Merseyside he continued to reside in Birkenhead, and on the destruction of his house by bombing in March 1941 he had a miraculous escape from death, being rescued almost unhurt while buried in the ruins. His wife did not long survive this experience. He is survived by two sons and two daughters.

R. W. S.