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 midsummer 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.