Robert Charles GEARY
b. 11 April 1896 - d. 8 February 1983

Summary. Geary contributed to areas of statistical theory, including normality tests, stochastic ratios and time series analysis, whilst working in Dublin as an official statistician and writing influentially on topics in that field, such as national income accounting and price deflation.

Robert (Roy) Charles Geary was born in Dublin, Ireland, the eldest child in a family of two sons and two daughters. His father was a statistician in the General Registrar's Office in Dublin and an enthusiast for statistics. Roy's childhood was a happy one. He proceeded to University College, Dublin in 1913 to study mathematics. He gained all possible prizes and honours as a student and won a Travelling Studentship to the Sorbonne in 1919. He studied mathematics there for two years under Lebesgue, Goursat, Borel, Cartan and Langevin and with Hadamard at the College de France. He returned to Dublin in 1921 where he gained some teaching experience and continued to study and research in mathematics.

This was the time of the Anglo-Irish War which was to lead to the foundation of the Irish State in 1922. Roy wished to contribute to the fledgling state and so, at the beginning of 1923, he turned down the offer of a university position in Southampton in favour of a post as Statistician in the Statistics Branch of the Ministry of Industry and Commerce in Dublin. He was to remain a government statistician until 1957, becoming Director of the newly estalished Irish Central Statistics office in 1949. He spent 1957-1960 in New York as Chief of the National Accounts Branch, Statistical Office, United Nations and then returned to Ireland to head the newly established Economic research Institute (ERI) in Dublin (see Kennedy, 1993). He remained with the Institute (later to become the Economics and Social Research Institute) for the rest of his life - as Director until 1966 and as Consultant thereafter until his sudden death.

Roy thus began work in 1923 publishing his first paper in 1925. Statistics was then in the midst of a great formative period to be dominated by Fisher (q.v.) who by 1925 had published his *Statistical Methods for Research Workers* and who was to be the abiding influence on Roy. But the immediate task in Ireland was the building up of the National Statistical Service and Roy, while initially junior, of course, was to be the key figure in this.

Over his subsequent civil service career, he played the major role in many

aspects of national statistics including the provision of greatly varied data. He provided at different times several sets of detailed population projections, a matter of great national importance, thereby debunking alarmist views, widely held in the 1940's and early 1950's, that Ireland's unusual demographic characteristics and high emigration propensity would lead to great shrinkage of population. He played the major role in the development of Ireland's national accounts and in many other statistics including various price and quantity index numbers. He also played an important role in official statistics at the international level, being one of the founding members of the Conference of European Statisticians.

Despite his arduous duties in the government statistical service, Roy was a prolific publisher in academic journals. This continued while he directed the E(S)RI, and indeed, to his death. Of his some 120 publications, more than half were written after his sixty-fifth birthday. Most are theoretical, and of these the most important were written between 1930 and 1956.

In a series of articles describing different elements of his life and work, Spencer (1976, 1983, 1993, 1997), I have separated his work into different streams. Apart from his work as government statistician (see Linehan, 1997), he wrote extensively and influentially on (a) ratios of random variables, (b) testing for normality and robustness, (c) estimating relationships between variables, where the variables are measured with error. A flavour of some of this work follows.

In *Journal of the Royal Statistical Society (JRSS)* 1930, he considered the ratio of two correlated normal variates and, under the assumption that the denominator was unlikely to be negative, established the density of the ratio. In *Biometrika* 1944, he generalised a 1937 theorem of Cramér on the distribution of the ratio of independent variates where the denominator is non-negative with finite man to the case of dependence.

In *Biometrika* 1935, 1947, he suggested the ratio of the mean deviation to the standard deviation (the Geary Ratio) as a test for normality. In 1938 he published with his colleague E.S. Pearson, a *Biometrika* brochure, "Tests for Normality". In *JRSS* 1936 and in his 1947 *Biometrika* paper, he considered the robustness of t and F tests in situations where the underlying distributions were not normal, showing, for example, that with t tests the main trouble arises with asymmetric parent populations. Thus, positive skewness of the parent population would lead to left tail rejection of the null hypothesis too often.

His early work on estimation was based heavily on cumulant theory and

is much less cited than his famous 1949 *Econometrica* paper which has been described as the definitive paper on instrumental variable estimation for the errors in variables model and which has led to Geary being described, with Reiersol, as the founder of the Instrumental Variables method of estimation of relationships.

He showed in his 1936 *JRSS* paper on robustness that independence of mean and variance imply normality, not just the well known reverse. In a 1942 *JRSS* paper he showed that maximum likelihood minimises that generalised variance and in a 1944 *Biometrika* paper, he established some relationship between Pitman's (q.v.) closeness and efficiency. In 1954 *Incorporated Statistician*, he introduced his contiguity ratio, a statistic designed to measure whether the data for adjoining spatial regions are more similar than for regions not adjoining. This is perhaps his most cited paper - cited not only in geography, but, in fields as diverse as agriculture, archaeology, biology, ecology, epidemiology, genealogy, genetics, human and veterinary medicine, sociology.

In almost all of his work, Roy's life in practical statistics is evident. How to forecast, how to estimate relationships, how to test hypotheses when data is poorly measured and when underlying assumptions are not strictly valid? These are for him the questions, with theory to be judged by how well it performs in practice and with mathematical statistics having its raison d'etre always in application.

This emphasis on application, while influenced no doubt by his life as a working government statistician, stemmed from his highly developed social conscience. This conscience was there from the beginning, exemplified perhaps by his decision to help with the practical side of things at the formative state of the new Irish State, but it probably increased as time passed. He saw the existence of a government statistical service as of enormous value in the stabilising of public opinion. Good data, he believed, had a vital role in narrowing the differences between parties. He constantly, as a civil servant, sought to improve the relevance, timeliness and accuracy of the official data and welcomed queries and indeed vists from outsiders. He believed that an independent statistics office was one of the principle guarantees of civil liberties and was proud to say that in his experience, the independence of Irish statistics had never seriously been challenged by the politicians.

He tirelessly advocated the necessity of quantification in research and was strongly critical of theory without measurement in the social sciences. He was particularly critical of economics, perhaps because he knew it best of

the social sciences - indeed, he contributed to it, for example, in regard to international comparisons of real income (Neary, 1997) - and perhaps because he thought it had, in principle, a lot to offer.

As a government statistician, much of his applied work must have been unpublished. he did, however, publish a great deal of applied work including applications as example in his theory papers. Thus, his 1930 *JRSS* paper on ratios contained an application to Irish data on mortality from tuberculosis, a topic in which he had a continuing interest. When he took over the Directorship of the new ERI in 1960, his owrk became more obviously applied in response to the need for relevant policy advice. For the remaining twenty-three years of his life, he increasingly turned to applied economics and social science. His personal prestige was crucial in the establishment of the Institute and its reputation as a reliable source of independent policy advice.

Roy received many honours in his life including Honorary Fellowships of the Royal Statistical Society and American Statistical Association. He was Acting President of the International Statistical Institute in 1957, was an influential Chairman of Council of the International Association for Research in Income and Wealth, 1961-1967 and was a Member of council, Econometric Society, 1962-1964. With all his success, he remained a man of great courtesy and charm and with a strong sense of humour. He had wide life-long interests, including his family, classical music, the theatre, sport, especially soccer, and politics. He abhorred conflict, whether labour-management conflict or physical violence, perhaps especially that in Ireland. His greatest legacy must lie in his mathematical statistics, the great bulk of which exemplifies the practical importance of good theory. But his contribution to the orderly development of Irish society through his work as government statistician and producer and analyst of data was also significant, though to an extent that is harder to measure.

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