ARTHUR L BOWLEY

A Pioneer in Modern Statistics
and Economics

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and Economics

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Portrait of Arthur L Bowley on the cover – courtesy of Royal Statistical Society

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When this book was nearing completion I learned with great regret and sadness of the death of Samuel Kotz. It was at his instigation and urging that we began this work, and his contribution, particularly in the discussion of Bowley's more economically orientated papers, made my task considerably easier. Samuel was not only a statistician but also (and this is perhaps more important) a scholar of note, and the academic world is the poorer for his passing.

A.I.D.

Sir Arthur Lyon Bowley

Preface

It is given to few in this world to make an outstanding contribution to a single discipline, and even fewer are capable of contributing in a noteworthy way to more than one. There are more, though they are also rarely found, who can make a significant and meaningful, though perhaps not outstanding, addition to two disciplines, and one of these was Arthur Lyon Bowley, whose work in the late 19th and the 20th centuries is remembered in both economic and statistical circles today.

In 2002 Stephen Stigler attempted a classification of a group of economist-statisticians. The *Great Middle Class* contained the names of those who were of importance in both economics and statistics but who lacked the importance of a *Master* in at least one of these disciplines, and here Stigler placed Bowley together with William Stanley Jevons, Ladislaus von Bortkiewicz, Wilhelm Lexis, Vilfredo Pareto and Frank Plumpton Ramsey.

From another point of view one may say that Francis Ysidro Edgeworth, Ronald Aylmer Fisher, Karl Pearson and Bowley dominated the development of statistics and economics in the United Kingdom from the late nineteenth century through to the first third of the twentieth. While the first three scholars dealt successfully with other scientific fields, Bowley devoted his work essentially to statistics and statistical economics.

The first issue of the *Journal of the Statistical Society of London* (a society that was to become the Royal Statistical Society in 1887)

clearly set out the interpretation of the word *Statistics* as it was to be understood by the Society [Anon., 1838, p. 1]:

Statistics ... may be said ... to be the ascertaining and bringing together of those “facts which are calculated to illustrate the condition and prospect of society;” and the object of Statistical Science is to consider the results which they produce, with the view to determine those principles upon which the well-being of society depends.

Distinction is made between Statistics as just defined and Political Economy, for while both have the same ends in view, the former neither discusses causes nor does it ‘reason upon probable effects’ (loc. cit.). Despite this sentiment, however, and perhaps more in the line of statistics as a deductive than an inductive science, it is further said here that ‘Statistics seeks to deduce from well-established facts certain general principles which interest and affect mankind’ [Anon., 1838, p. 3]. To a large extent these early statements were endorsed by Bowley in his statistical work, and in his *Elements of Statistics* we find the explicit definition of Statistics as ‘the science of the measurement of the social organism, regarded as a whole, in all its manifestations’ [1901a, p. 7].

We believe that Allen [1968] was correct in describing Bowley ‘first and foremost’ as an applied statistician. His field of practice was wide, as we shall see, but one may well view it as the social sciences, perhaps with emphasis on economics. Bowley’s major contribution to statistics lay in his discussion of sample precision and in his development of sampling techniques—not in the agricultural field where analysis of variance and experimental design are paramount, but rather in the application of such techniques to economic and social studies (see Allen [1968]).

Fisher wrote ‘The science of statistics is essentially a branch of Applied Mathematics, and may be regarded as mathematics applied to observational data’ [1925, p. 1], and later he stated that Alfred North Whitehead used to say in one of his courses ‘The essence of applied mathematics is to know what to ignore’ [1938, p. 16]. Elsewhere

we read that Lord Kelvin is supposed to have said that the essence of applied mathematics is to know when to approximate (Smith [1997, p. 41]). Both sentiments, we shall see, were characteristic of Bowley's work.

While his knowledge of, and ability in, mathematics was not inconsiderable—he had, after all, been joint tenth Wrangler in the Mathematical Tripos examination at Cambridge, and had published *A General Course of Pure Mathematics from Indices to Solid Analytical Geometry* in 1913—Bowley did not shine in this field, publishing little in mathematical statistics and mathematical economics. Mathematics to him was in the main a tool, and incidental to his chief concern.

Bowley's interest in social welfare naturally required his use of data obtained from official sources and censuses. He was a severe critic of such data when the need arose, and had he been called upon by the government as an advisor Britain might have enjoyed considerably improved social and economic statistics in the early twentieth century. Nevertheless, describing Bowley as 'the most innovative, policy-oriented social and economic statistician of his generation', Szreter and Smith said

It was substantially Bowley's considerable authority and influence that resulted both in the important innovation of a parallel classification of the employment information, by personal occupations and by industrial function, which was adopted at the 1921 census; and also in the attempted family dependency analysis at that census. [1996, p. 275]

Bowley undertook several studies of working-class households in England, carefully describing in print how the sample was obtained. His use of representative and purposive sampling, later endorsed by the International Statistical Institute, ensured that data obtained from these studies were both reliable and useful. In the early 1930s he contributed significantly to Hubert Llewellyn Smith's *New Survey of London Life and Labour*, a large study of conditions in the

capital. Here again Bowley may be seen as following the principles of the founders of the London Statistical Society, who stated that ‘its [i.e. statistics]’ peculiarity is that it proceeds wholly by the accumulation and comparison of facts, and does not admit of any kind of speculation’ [Anon., 1838, p. 3]. Bowley’s surveys, we shall see, also followed the further stipulated requirement that they be based on well-attested data and that they ‘admit of mathematical demonstration’ (loc. cit.).

A list of Bowley’s published work runs into hundreds, including not only papers—Bowley lectured for many years at the London School of Economics and Political Science—but also numerous books (many of which have become classics in the corpus of English statistical writings of that period and remain unsurpassed in quality, coverage and exposition) and many thoughtful reviews.

Bowley was a diligent member of the International Statistical Institute and Fellow of the Royal Statistical Society, and often featured as one of the discussants of papers read before the latter.

Are sins of omission as bad as sins of commission? The reader will no doubt wonder not only why we have chosen to include certain of Bowley’s writings but also (and this might prove more exasperating) why we have omitted certain others. In mitigation we can only say that we have tried our best to consider those that we thought important and representative of Bowley’s varied interests.

No commentary on or discussion of Bowley’s work can do justice to the clarity, carefulness and conciseness of his writing. In his discussion of one of Bowley’s papers Rew said ‘to praise Dr. Bowley’s statistical work was almost an impertinence, and to criticise it almost an impossibility’ [Bowley, 1914c, p. 646], and as a general observation one can only echo William Hazlitt, who wrote

If we wish to know the force of human genius, we should read Shakespear. If we wish to see the insignificance of human learning, we may study his commentators.

[*Table Talk*, 1908, p. 77]

Acknowledgements

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Considerable use has been made of Agatha H. Bowley's *A Memoir of Professor Sir Arthur Bowley (1869-1957) and his Family*. This book was printed privately in 1972, and despite considerable effort, we have regrettably been unable to trace the present copyright holder. Quotation from this book has done much to shed light on the Bowley family and to enliven the present work.

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