

Francis Ysidro Edgeworth's Other Passion — Probability and Statistics

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Charles R. McCann, Jr (editor), *F.Y. Edgeworth: Writings in Probability, Statistics and Economics. An Elgar Reference Collection*. Edward Elgar, Cheltenham, 1996. Three volumes (454, 550 and 609 pages). ISBN 1-85898-238-3. £315.

Francis Ysidro Edgeworth (1845 - 1926) has long been known among economists for his seminal contributions to the development of utility theory, indifference curve analysis, and the "box diagram" with its contract curve. He is rather less known among economists for his substantial body of work in a second field to which he applied himself with intellectual passion, the field of probability and statistics.

Of some 170 publications by Edgeworth, about 100 are in this second broad field. This set of three large volumes collects together 76 items from these 100, as well as 13 of his book reviews, and it would be safe to assume that little of major importance has been omitted (though no listing of omissions is given).

Edgeworth's long and constantly active scholarly life (1883 - 1926) brought him into fruitful contact with three generations of intellectual giants in both economics and statistics. One need only mention Alfred Marshall (1842 - 1924) and Maynard Keynes (1883 - 1946) in the first domain and Francis Galton (1822 - 1911) and Karl Pearson (1857 - 1936) in the second to make the point abundantly. To these names should also be added Stanley Jevons (1835 - 1882) and Arthur Bowley (1869 - 1957), each of whom, like Edgeworth himself, straddled both domains. Jevons was a great stimulant to Edgeworth's thinking and Bowley became an esteemed disciple.

Though Edgeworth's name is prominent in all histories of economic thought and of statistical thought, one has the impression that the intellectual legacy of these other scholars has generally overshadowed, and even obscured from view, Edgeworth's originality and insightfulness. Edgeworth did little in his lifetime to forestall such a state of affairs. He pursued his inquiries with considerable independence of spirit, he did not go out of his way to align himself with the mainstream evolution of ideas, he fostered no intellectual "school", and he spread himself thinly over an immense area of scholarship. It is an astonishing aspect of this last point that much of his creative work rests on foundations which were apparently self taught. This is true, in particular, of his wide and deep knowledge of mathematics and of the fledgling field of statistical inference.

A principal motive for the publication of the present collection, the editor writes (volume I, page xxi), is to offer the present generation of scholars a convenient source for appraising, from his own writings, Edgeworth's intellectual vitality and contribution.

The 89 items reproduced are arranged chronologically by date of publication under seven subject headings. Volume I contains 15 items under the heading *Probability*, and 14 under the heading *The Law of Error*. Volume II includes 25 items, all under the heading *The Theory of Statistics*. In Volume III, which focuses on *Applications of*

Probability and Statistical Theory, 35 papers are further grouped under four subheadings: applications to economics and the social sciences (15), applications to physics, chemistry and biology (11), applications to education (6), and applications to psychical research (3).

The entire collection is prefaced in volume I by a valuable but frustratingly brief Introduction by the editor. Its 12 pages contain a skeletal outline of Edgeworth's life and career, a short overview of Edgeworth's standing as a scholar in his lifetime, and a series of observations on the nature and significance of Edgeworth's intellectual contribution as evident from the perspective of today. There are also some short commentaries on several of the major papers included in this collection.

What is disappointingly missing from these volumes is a rich sense of the context within which each paper was written – so much of what Edgeworth wrote was woven into a tapestry of ongoing discussions, debates and disputes with other scholars on a wide front. Whether it would have been better to have an explanatory paragraph or two at the head of each item in this collection, or a longer essay within the Introduction is a matter of taste, but, in the absence of real guidance to the reader on the work of a scholarly lifetime, the appeal of this collection is likely to be restricted to those who already have a firm grasp of the history of ideas in probability and statistics.

The editor hints that he realises the effect of this absence, for he references about a dozen papers, both contemporary and modern, dealing with Edgeworth's life and work, and urges "[a]nyone coming fresh to the study of Edgeworth's contributions to statistics ... to begin his adventure with a perusal of these articles" (volume I, page xv). This is sound advice! Without such a preparation, the seeker after enlightenment at the source is likely to go away unfulfilled.

At the same time, it would be wrong to say that there is nothing in this collection, as it stands, that will appeal to a statistician with only a casual grasp of the history of ideas. At least a dozen of the papers are readily accessible to such a reader, and some of them are gems, revealing clearly both Edgeworth's perceptive reasoning and the ingenuity of his analyses. Among such papers, I would highlight item 15 in volume I (a fine essay on "The Philosophy of Chance"); item 18 in volume II (a book review that displays much methodological wisdom); item 23 in volume III (a lively empirical study entitled "Entomological Statistics"); an incidental commentary, in volume III, pp. 445-6, on whether the decimal digits of various mathematical constants are randomly distributed; and item 27 in volume III (a searching analysis of fairness of marking in competitive exams, entitled "The Statistics of Examinations").

What is at once apparent to the modern reader of these papers is how close their themes are to some academic and practical issues of today. To take just two instances: the digits of mathematical constants have been extensively examined in recent years as a possible source of (pseudo)random numbers for performing simulations (see, e.g., Stoneham (1965)), and the choice of a statistical-scaling procedure for relating marks in different subjects at the Higher School Certificate examination is a matter of continuing public concern and controversy.

What of the less immediately-accessible papers in this collection? Edgeworth's contributions remain interesting today for their intellectual substance, I would say, and not for the language in which they are expressed. Though Edgeworth generally takes care to map out his arguments in advance of the fine detail, the reader can often get lost. It makes for an engaging commentary on Edgeworth's exposition that, in a vote of thanks reproduced (in volume I, p. 431) from the *Journal of the Royal Statistical Society* of 1906, the then President of the Society is reported as saying ingenuously "[p]apers like this were ... of the greatest value, even if some [ordinary investigators], including himself, were not able to fathom them completely"!

Edgeworth's literary style is neither especially succinct nor vivid: indeed, it often verges on the obscure. Moreover, almost all the papers bristle with quite complicated mathematics. These characteristics can make even an informed reader's task heavy going.

It is always an aesthetically risky endeavour to reproduce large quantities of text from a diverse set of printed sources of a past era. In my experience, the main risk factors are: widely varying fonts, compression of various original page sizes to a single print-area page format, and poor reproducibility of diagrams.

In the present case, these things have generally turned out very well. There happened to be relatively few different fonts, and hardly any of the papers suffer from page size compression – though item 13 in volume I and item 6 in volume III will drive many readers to their optometrist. More troublesome has been the reproduction of diagrams. There are about half a dozen papers, all from the *Journal of the Royal Statistical Society* – which chose at that time to print diagrams as thin white lines on a densely shaded background – in which the diagrams in my review copy are just solid black rectangles. Clearly, it would have been helpful to have had these diagrams redrawn before sending the volumes for printing.

There are two other contributions the editor ought, I think, to have made.

Firstly, to provide a unified chronological (or alphabetical-by-title) listing of all the 89 papers in these volumes, as well as the papers included in a previous compilation of some of Edgeworth's statistical work (Mirowski (1994)). Such a comprehensive listing would make it easy for the interested reader to check – whenever Edgeworth cites himself – whether that cited paper is included in one (or both) of these collections.

Secondly, to complement the very useful name indexes at the end of each volume by a glossary that would identify many of the people Edgeworth mentions and to sketch how and why they came to be mentioned.

A great benefit of reproducing text photographically is that it minimises opportunities for typographical gremlins. But gremlins are nothing if not persevering, and they have found their way into the Introduction, where "populous" appears in place of "populace" (page xi), and a quadratic exponent has been omitted from all four variance formulae on page xvii.

The editor and the publishers have done well, I believe, in bringing so much of Edgeworth's work to renewed notice. Some of this work was originally published in very out-of-the-way locations. The editor deserves the thanks of the scholarly community for the thoroughness of his searches.

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References

- Mirowski, P. 1994, *Edgeworth on Chance, Economic Hazard, and Statistics*, Lanham, Md: Rowman and Littlefield.
- Stoneham, P.G. 1965, "A study of 60,000 digits of the transcendental 'e'." *American Mathematical Monthly* 72: 483-500.