Karl Pearson's History of Statistics
The History of Statistics in the 17th and 18th Centuries against the Changing Background of Intellectual, Scientific and Religious Thought by Karl Pearson; E. S. Pearson
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Review Articles

KARL PEARSON'S HISTORY OF STATISTICS*

This is a fascinating publication. It is certainly the most interesting book about the history of statistics ever to have appeared. But it is more than that. It is an intellectual testament to a remarkable mind, quirky, charming and irritating by turns, but always curious, open and intelligent. The book is also a treasure trove of information on unlikely topics. It is a year's read, and, at a penny a page on publication, it is good value.

Karl Pearson (1857–1935) is one of the handful of founders of modern statistics, not only through his own ideas but also through the institutions he helped create and the students whom he taught. He had numerous historical hobbies, such as German folklore. He provided historical introductions to lectures early in his statistical career. Late in life he commenced the series of lectures on the history of statistics which have now been edited by E. S. Pearson. Naturally the notes for the lectures spanning twelve years overlapped a certain amount, but the editor has formed them into a coherent whole. He has omitted some work already published in Pearson's journal, *Biometrika*, and has also left out what seemed to be mere algebraic reworkings of standard works. (The entire lecture notes are available in the archives of University College, London.) E. S. Pearson has done a certain amount of checking, for his father's practice was, it seems, to get up the lectures week by week while reading the original texts. One would expect quite a few errors, but in fact the result of the Pearsons' labours is pretty accurate. The notes are here reproduced from typescript. Since the pages have not been reduced and the quality of the reproduction is excellent, this makes for an easy if bulky read.

The topics roughly follow the canonical texts of Isaac Todhunter's 1865 *History of the Mathematical Theory of Probability from the time of Pascal to that of Laplace*, except that Pascal is not redone. The structure of the book is, however, quite different from Todhunter. It falls into two parts, representing two quite different courses of lectures. It is not unjust to call pages 1–421 the English half while pages 422–734 are French. The French part is about 'the great French mathematicians': Condorcet,

* Review of KARL PEARSON [1978]: *The History of Statistics in the 17th and 18th Centuries against the Changing Background of Intellectual, Scientific and Religious Thought. Lectures given by Karl Pearson at University College London during the Academic Years 1921–1933.* Edited by E. S. Pearson. London: Charles Griffin and Company. Paperback £7.50. Pp. xviii + 744.

D'Alembert, Lagrange and Laplace. It is more the ideas than the mathematics of the first two that intrigued Pearson, and in the case of Laplace we have a quite interesting study of the *Essaie Philosophique* but nothing much about his many memoirs or the *Theorie Analytique*. (Pearson was seventy five by the time he had got to Laplace.) As for the 'English' side, it starts with John Graunt and is strongly concerned with political economy and vital statistics. In fact only slightly more than half the chief figures are English, and Euler and the Bernoullis figure in this part, but these lectures are organised around a post-Newtonian intellectual tradition that flourished in English. Although there is much of interest in the 'French' lectures, Pearson's heart was in the 'English' ones, and there he has a thesis as well as a good story.

Pearson is a successor to Todhunter in more than one sense. Todhunter wrote numerous histories of mathematics, but died before he had completed his history of the mathematical theory of elasticity. It will be recalled that elasticity was, towards the end of the nineteenth century, a subject of the first importance—think, for example, of questions about whether the electromagnetic ether is elastic or not. Pearson had impressed Todhunter by his answer to a question about elasticity during a Smith's Prize examination, and in due course Pearson edited Todhunter's three volumes on elasticity between 1887 and 1893. He was a loyal editor. To the casual observer, who in many libraries will be cutting some of these pages for the first time, this material looks like vintage Todhunter, despite the fact that Pearson, in his preface especially written for part of volume II in 1890, apologises for editorial licence.

Pearson, with his wide ranging historical curiosity, and who only a few years earlier had been scribbling socialist ditties, must have smarted under this taskmaster. Naturally he comments on Todhunter frequently in the statistics lectures, chiefly indicating what Todhunter missed. He sums up his opinion on page 488:

> There are three kinds of mathematical mind . . . *Secondly* the mind absolutely lacking in imagination, but intensely competent in and therefore fond of analysis. . . . Todhunter's mind was essentially of the second type, stringently orthodox in his ideas, whether of analysis, education or conduct.

Pearson's historiographical approach certainly differs from Todhunter. Very many of his discussions end with an apology for going so far afield from the mathematics. Here is a typical example:

> It is impossible to understand a man's work unless you understand something of his character and unless you understand something of his environment. And his environment means the state of affairs social and political of his own age. You might think it possible to write a history of science in the 19th century and not touch on theology of politics. I gravely doubt whether you could come down to its actual foundations, without thinking of Clifford and Du Bois Reymond and Huxley from the standpoint of theology and politics. What more removed from those fields than the subject of

Differential Equations? What more remote from morality than the subject of Singular Solutions? Yet you would not grasp the work of De Saint Venant or Boussinesq unless you realised that they viewed Singular Solutions as the great solution to the problem of Freewill, and I hold a letter of Clerk-Maxwell in which he states that their work on Singular Solutions is epoch-making on this very account! (p. 360).

This is quite a personal paragraph. He had attended Du Bois Reymond's wide ranging lectures during his German 'post-graduate' days. He was Clifford's successor in a professorship at University College. De Saint Venant is clearly the hero of the elasticity studies, and in 1890 Pearson produced a single volume of Todhunter solely devoted to De Saint Venant (of whom the Boussinesq mentioned above was the prize pupil). Presumably Pearson regrets that he could not have included Freewill in a more freewheeling volume on De Saint Venant. Even in the 1920s Pearson could cite De Saint Venant, along with Newton and Kelvin, as exemplifying his third type of mathematical mind, 'the mind which combines the two factors of imagination and analysis—a rare mind which leads to greatness in mathematics.' Pearson himself undoubtedly represents the first kind of mind, 'the mind strong in imagination, which can grasp new problems which can be solved mathematically'. One might think when one reads in these lectures about problems which he cannot undertake, but suggests to younger workers, that these are the remarks of an old man: but no, a similar passage occurs in the De Saint Venant book. It was Pearson's genius often to recognise that something could be treated mathematically, although his own treatment may have been unsuccessful.

E. S. Pearson refers to an unnamed young historian of science who says that Pearson *versus* Todhunter 'reads like a contribution to a much more modern historiographic debate,' *i.e.* internal *versus* external history (p. xiii). It doesn't read that way to me. For one thing Pearson is not a bore about methodology. He is concerned with the well-rounded man in public life. He thinks you need to understand a man's *conduct* and *character* in order to understand his mathematics, and hence you have to set him in his times. 'It is impossible to judge fairly of Simpson's later conduct without recollecting that he started as a charlatan and a disciple of Partridge'—and Partridge was a tinker! (p. 169). Pearson writes from a world that still has cads: That Simpson 'was a man of some ability may be admitted, that he was wretchedly poor may be partial excuse for his proceedings, but to me he is distinctly an unpleasant and truculent writer of cheap textbooks, not a great mathematician like de Moivre' (p. 167).

This is also a world of high standards. Young Biot came to Laplace with a manuscript containing some results and ending with a proposal. Laplace says, publish the results and forget the proposal. So Biot removes the epilogue that suggested further research. After Biot delivers his results to the best mathematicians of the age, plus Napoleon, Laplace shows him 'a quire of paper, yellow with the years'. Here are all of Biot's ideas, worked through long ago by Laplace, who, realising that the next stage seemed impossible, gave up this line of research. Biot promises to keep this a secret. Pearson writes of this story,

> I cannot say that it shows either Laplace or Biot in the most favourable light. It was open to Laplace to do one of two things: to show the youthful physicist his own manuscript before the latter's paper was read, or, saying nothing about it, to burn it. There was a double vanity in showing it to Biot after he had read his own paper—the vanity of first discovery and the vanity of generosity. On the other hand Biot must have been thinking of his own advancement when he allowed himself to be bound to secrecy. If Laplace refused to permit him to say that he, Laplace, was the first discoverer, then Biot should have withdrawn his paper (p. 645).

There are, then, plenty of anecdotes. It is a tribute to Pearson's sharp eye that his material on vital statistics is still of interest. At the time of his lectures it was only a collection of curiosities. Later on French and subsequently English historians and demographers have made this material a tool in their researches. It forms part of our knowledge of the populations of Europe. Many of the documents cited by Pearson have now been reprinted from photocopies, yet he is still instructive reading because he gives us the larger picture. Pages 137–8 provide the most vivid statement of the lack of empirical statistical data before the nineteenth century—and the consequent speculation and fraud in the booming 'insurance' business. Pearson rightly observes that one cannot understand the work of De Moivre and less famous eighteenth century students of annuities except against this background of sheer absence of known statistical data. But like other writers he leaves one question unasked. Why didn't people obtain the then available data? At the end of the eighteenth century Price did, once, go through the records of Northampton parish to draw up mortality tables. Milne did something similar for Carlisle a little later. Since insurance was such a roaring trade in the seventeenth century why were such data not obtained long before Price and Milne? Why were even their (incompatible) tables the sole data for three decades of the nineteenth century?

Pearson was himself both struck by and concerned with statistical stability. Why do we have stable frequencies in so many walks of life? Attuned to this question because of his own perplexities, he is sensitive to earlier answers to it. This leads him to the one thoroughly general thesis of these lectures. He holds that there is a view about statistical stability which is a natural successor to the 'Newtonian' idea of a world governed by an active omnipresent mind—and which Pearson contrasts with the continental 'Leibnizian' idea of a world set in motion once and for all. The 'Newtonian' idea of Pearson's we might call statistical occasionalism. There are statistical regularities because God arranges the proportions to suit various ends.

There is no doubt that one Boyle lecturer, William Derham, states such a view. It is not so easy to show that this idea is generally held during the eighteenth century. One of Pearson's heroes is De Moivre, whom he firmly places in this tradition. Such an analysis has recently been supported, with further details, by Ivo Schneider ([1980]). If it is correct, it provides a fascinating way in which the most straightforward determinism is allowed not only to make room for chance phenomena but actually to embrace them. It is the eighteenth century equivalent to the nineteenth century programme of trying to derive statistical distributions from large numbers of tiny independent causes. Pearson believes that the Newtonian tradition continued even into the times of his own youth, when reformers such as Florence Nightingale deployed statistics with some effect.

Statistical occasionalism furnishes the strongest example of Pearson's view that the intellectual climate is important for understanding the work of the mathematicians. I do not think he makes much of a case that even De Moivre's actual mathematics is affected by occasionalism. Indeed I'm not sure that any of his fascinating studies of conduct and character clarify any of the mathematical issues. This is true even in what might be a favourable case, that of D'Alembert. Although the encyclopedist is grouped with 'the great French mathematicians' Pearson has no illusions. 'What then did D'Alembert contribute to our subject? I think the answer to that question must be that he contributed absolutely *nothing*.' (p. 535). D'Alembert was an iconoclast who called in question many established ideas about probability. Pearson is sensitive to these difficulties, although he thinks they can all be overcome. But nothing in his intellectual biography of D'Alembert prepares us for or explains these seemingly strange notions about probability. When we move back to the English side of the book I have the same complaint. There is an excellent chapter called 'The combination of mathematics and theology. Bayes and Price and their background.' There is mathematics here and there is theology here, but after reading Pearson it still seems entirely fortuitous that a dissenting minister should have established the classic result in inverse probability.

One merit of the book has not yet been mentioned. Pearson tries to check out most of the arguments himself. The reader needs no more scholarship than a skimming of Laplace's *Essaie Philosophique* to know that it is often very difficult to reconstruct even a seemingly simple algebraic argument. Pearson wrestles with these, often with success, and sometimes puts in a simpler modern derivation. This is of course the most lowbrow kind of history of mathematics, but Pearson's notes will from time to time prove a godsend to future readers of some of these old texts.

I conclude with what could be one of the most important chapters for the modern reader—the discussion of Condorcet (1743–94). It has been noticed from time to time that Condorcet is of some influence. Charles Gillespie proposed that he got Laplace interested in probability. In terms of direct filiation one counts both Comte and Quetelet, the joint though antagonistic founders of the 'social physics' that became sociology. Only one piece by him is well known, the testamentary essay composed directly before his death in Robespierre's jail. The *Sketch for a Historical Picture of the Progress of the Human Mind* set the stage for much nineteenth century thought. It is a mere programme and easy to read. In contrast, his 1785 essay on the probability of decisions is very hard. It is well to remember that when S. D. Poisson wrote on related topics in 1837, even he, despite his mathematical power and clarity of exposition, was very little understood. Pearson is extremely good at teasing out the questions Condorcet is asking. Far from dismissing him (as Todhunter had done) he sees that there is an immense amount more to be done with these ideas about voting and decision.

Pearson thinks that Condorcet was 'the first writer who had a philosophy of his science, and indicated that our belief in the stability of statistical ratios is precisely the same as our belief in the so-called natural laws' (p. 499). He is at one with Condorcet in more ways than this, for the man 'proclaimed a new philosophy;—that social facts are capable of measurement and thus of mathematical treatment, their empire must not be usurped by talk dominating reason, by passion displacing truth, by active ignorance crushing enlightenment' (p. 495).

The right 'third volume' of Pearson's study would be a comparable history from Condorcet to Pearson himself. (The second volume would deal with Laplace and Gauss.) But I do not know that one should be so sanguine about 'passion displacing truth'. As classes and populations became objects of study, subject to their own 'natural laws', whole new categories of truths came into being. Galton and Pearson have recently had a bad press because they started eugenics. They wanted to breed intelligent people with the virtues they ascribed chiefly to prosperous Victorians. I have no sympathy with the cant which holds this extreme 'nature' thesis in contempt while approving excesses in the name of 'nurture'. Both are manifestations of a certain politics of populations, which has late eighteenth century roots, and which regards populations as objects of natural law and of knowledge, and hence to be controlled *for their own good*. Philanthropic Benthamism, Marxist socialism and the like are all manifestations of this new conception. The political result of all these programmes for population has been chiefly a sort of insurance technology. It provides the core of the stability of modern states, independent of superficial politics. The tradition of Condorcet through Pearson is an integral part of the formation of this technology. One of the sources of its irresistible power is its innocent belief that it is concerned only with 'social facts and their mathematical treatment', objective givens that might prevent 'passion displacing truth'. In fact these writers were making way for a whole new category of truths and falsehoods. We now have in consequence a lot of *a priori* beliefs about humanity that were not even thinkable before Condorcet, and which were not well fixed even when Pearson was in the prime of life.

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REFERENCE

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KARL MENGER AS A PHILOSOPHER*

1 INTRODUCTION

Anyone glancing through Menger's selected papers will be immediately struck by the range of the topics discussed. These include *inter alia*: intuitionism, set theory, optative and imperative logic, theory of variables, the design of intelligence tests, probabilistic micro-geometry, uncertainty in economics. On careful reading, however, it becomes clear that, from this apparent diversity, a surprising unity emerges. Whatever the subject-matter, Menger's treatment of it is inspired by a single, coherent, philosophical view-point. The present volume of selected papers is particularly well-designed for bringing out this viewpoint, since, although Menger gives interesting descriptions of some of his technical achievements, the emphasis is never on the technicalities as such, but rather on the related philosophical problems.

What then is Karl Menger's unified philosophical outlook? Not surprisingly for a member of the Vienna Circle, it is *logical positivism*, and this label actually fits Menger better than it does some other members of the Circle. Menger is a Machian positivist in that he holds that a good science should consist of laws which state correlations between sensations, and which are well-confirmed by observation and experiment. However,

* Review of KARL MENGER [1979]: *Selected Papers in Logic and Foundations, Didactics, Economics*. The Vienna Circle Collection, volume 10. Dordrecht: D. Reidel. D. Fl. 110. Pp. 341.