● *ABSTRACT*

Karl Pearson (1857-1936) is often considered to be the father of the modern discipline of statistics, which emerged from his work in mathematical biology or biometry. Pearson's statistics was, by turn, integrally linked with attempts to establish eugenics as the queen of the social sciences. This paper argues that to understand (i) Pearson's taking to biometry, (ii) biometry's power to yield developments in statistics, and (iii) the association of eugenics with statistics, we must understand Pearson's philosophical and social views, developed before he took to biometry. The closing section of the paper analyzes the ways in which Pearson formed these views in response to the social and intellectual problems posed to him by the conditions of his late-Victorian life. The possibility of explaining the particular pattern of his response in terms of the natural interests of persons occupying his social position is mentioned, as are the difficulties of such an explanatory strategy.

Karl Pearson and Statistics:

The Social Origins of Scientific Innovation

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Karl Pearson (1857-1936) is widely regarded as the founder of the modern discipline of statistics, and is also famous as a philosopher of science, as a writer on social Darwinism and as a leading mover to install eugenics as the key social science.[1] He offers the prospect of a profitable study of the relations which may hold between a man's scientific work on the one hand and his social and philosophical views on the other — and between both of these and the historical 'forces' of his time.

It is good to begin by recalling some leading aspects of Pearson's life and career. He was the son of William and Fanny Pearson. William was a self-made man who had risen from a rural background to become a successful London barrister: Fanny was the daughter of a ship's captain and owner. In his youth Pearson moved steadily through the educational channels then available to the professional middle classes, going from University College School, via a crammers, to King's College Cambridge where, in 1879, he was third wrangler in the mathematics tripos. In the following year he was awarded a college fellowship, which gave him six years of financial independence. Pearson undertook postgraduate studies in the universities of Heidelberg and Berlin, and later, whilst ostensibly preparing for a legal career, wrote and lectured on German history and on the 'advanced' topics of his day — anarchy, socialism, sex, womens' rights, and so on. This radical scholarship was not staunched by his appointment to the chair of applied mathematics and mechanics at University College London in 1884, being in fact supplemented by work in the history and philosophy of science.[2] 'Non-scientific' writing, interestingly, ceased only after Pearson's meeting with W.F.R. Weldon (1860-1906), University College's professor of zoology, who, on his appointment in 1890, was seeking to inject the then new statistical techniques of Francis Galton into what he (Weldon) had come to regard as the moribund field of evolutionary biology.[3]

Weldon needed mathematical assistance if he was to succeed, and it was perhaps natural that he should turn to Pearson, as they were colleagues in the cause of university reform.[4] Pearson gave more than a little assistance, and from 1893 onwards, began to produce memoir after memoir on the 'mathematical theory of evolution', published at first in the mathematical volumes of the *Philosophical Transactions* of the Royal Society. These memoirs were, in fact, exemplars of a new discipline of *biometry,* and Pearson's contributions to biometry over the next fifteen years were to yield developments in statistical theory which Churchill Eisenhart sees as having 'firmly established statistics as a discipline in its own right'.[5] These developments in theory were sustained by institutional moves: in 1901 Pearson and Weldon founded *Biometrika,* and , on Galton's demise in 1911, Pearson became the first Galton professor of eugenics at University College London, taking a chair established in that year with funds left by Galton in his will. By 1911, Pearson was already director of a 'Biometric Laboratory' within the applied mathematics department at University College, and also director of the 'Galton Laboratory for National Eugenics', which had been set up, with Galton's assistance, in 1906. Now he could combine the two into a Department of Applied Statistics — the first such department.[6]

The Biometric Laboratory developed statistical methods in a biological context, and the Eugenics Laboratory applied these in work held to show the high dominance of nature over nurture in human affairs. The two put out a range of publications: *Biometrika* itself, a range of biometric and eugenic memoirs, tracts on issues of the 'Day and Fray', several 'Studies in National

Deterioration', and, from 1926 onwards, the *Annals of Eugenics,* now reborn as the *Annals of Human Genetics.*

For many years Pearson's department was England's premier source of statistical tuition, attracting students later to achieve fame and posts of importance, and producing publications that were to affect significantly the thought of biologists, psychologists, sociologists and statisticians. Both G. Udny Yule and (looking to a later period) Jerzy Neyman were intimately associated with the department at various times.[7] Certainly, in Pearson's time, statistics was always associated with eugenics, and, more generally, was strongly promoted as a mathematical methodology that was capable of elevating several disciplines — for instance, psychology, anthropology, sociology and craniometry — into truly scientific ones. To the end of his tenure in 1930, Pearson emphasized the need to construct a research institute where a 'novel calculus could be applied to problems concerning living forms'.[8]

On retirement, Pearson saw his department divided into a statistics department under E.S. Pearson, and a department of eugenics under R.A. Fisher. Interestingly, in 1937 there was set up a Weldon chair of biometry, funded by money bequeathed by Weldon's widow: the first incumbent was to be J.B.S. Haldane.

Putting aside the fascinating issues of funding and personnel involved in Pearson's development of the discipline of statistics, we should now be able to discern a number of clear and important historical problems. One wonders why it is that Pearson should take to evolutionary biology, to biometry, some fifteen years after his graduation as a mathematician. Similarly, one wonders why this biological work, this biometry, should have led to major developments in statistical theory. Then, one wonders how Pearson's statistics related to his work in the philosophy of science and eugenics — and, indeed, why he should have promoted statistics as a universal methodology for the human sciences.

In this paper I will attempt to develop a thesis of the following sort. Pearson entered willingly into biometry when presented with the opportunity by Weldon, not because of Weldon's exceptional charm or because Pearson was short of problems of his own, but because by the time that he met with Weldon, Pearson had independently developed a pattern of social, philosophical and political thought which disposed him to find Weldon's programme of mathematical biology one of the greatest possible significance. Before meeting with Weldon, I shall argue, Pearson had grown into a social Darwinist anxious to provide his particular form of Darwinism with a proper scientific basis, and to show that Darwin's ideas and socialism were complementary, and not opposed, as had been maintained by several leading thinkers of the nineteenth century. Biometry offered him the chance of pursuing these ends. Moreover, I shall argue, Pearson's conception of 'properly scientific' (as articulated in his philosophical writings) was one that made it probable that the development of biometry, should it be at all forthcoming, would yield a harvest of statistical methods. Statistics, thus formed, embodied the central tenets of Pearson's philosophy of science, and, as such, was to be universally recommended. It was to be applied to eugenics in particular, for eugenic thought was a component of Pearson's social Darwinism before his meeting with Weldon. Pearson's Darwinism and his philosophy of science, I shall argue, were integrated components in a world view constructed by Pearson in early manhood, when he was attempting to come to terms with the social and intellectual problems posed to him by his life within late-Victorian society. Thus, I shall argue, we must see Pearson's work in statistics as the outcome of his attempts to deal with his social and intellectual milieu.

The thesis is here developed in several sections, and it will perhaps be useful to give a preliminary account of the ordering of these sections and of their contents.

I commence with a section entitled 'Biometry and Statistics'. Here, after providing social and intellectual background to the biometric movement, I attempt to show something of the way in which biometric problems led to the creation of the statistical ideas for which Pearson is famous and which were to form the core of the tuition offered within his biometric laboratory and his department of applied statistics. At this stage, something of the relationship between the distinctive philosophy of science developed by Pearson before his meeting with Weldon and his subsequent biometric and statistical endeavours should start to become apparent. We should be able to see by the end of this section that the form taken by biometry, and its role as the midwife of statistics may largely be understood via its relations with the philosophical views formed by Pearson before he took to biometry. At this stage too, Pearson's espousal of statistics as a universal methodology should become comprehensible.

The second section, 'Science, Socialism and Social Darwinism', addresses the further topic of why it was that Pearson was prepared to be interested in biology when approached by Weldon. It is one thing, after all, to explain (in the manner of Section 1) the particular form taken by biometry, and to exhibit this form as a cause of biometry's having led to statistics. It is another, distinct task to explain why Pearson should have been prepared to enter into *biological* work. At the time it was not a recognized or honoured path for the mathematician and seems to have done little for Pearson's career prospects — as, for example, when he applied without success for the Savilian Chair at Oxford in 1897. The line I take in this second section is that of denying that Pearson was ever primarily interested in biology in its own right. I shall suggest rather that by the time of his meeting with Weldon, Pearson was already an established social Darwinian — that is to say, one who supposed that a scientific guide to human affairs could be obtained from the philosophy of Darwin, suitably interpreted. Pearson, I will show, entered into biometry, into evolutionary biology, not only with a view to giving an exemplar of a truly scientific biology, but also with the aim of providing his social Darwinism with suitable underpinnings; he also hoped to show that Darwinism enjoined a move to state socialism, rather than to the laissez-faire capitalism recommended by earlier writers on social Darwinism. At this stage too, we shall see that before meeting Weldon Pearson's thought already had a significant eugenic component.

In a third section, entitled 'Scenes from a Victorian Life', I attempt to trace the development of the patterns of thought which, I claim, predisposed Pearson to take to biometry. Here I will discuss his early days in Cambridge, Heidelberg and London, tracing the incidents and problems thrust upon him by the conditions of his life; I will show how his responses to these led him to the 'primed' condition that disposed him to respond so favourably when approached by Weldon, and thus started the major enterprise of his life — the building up of a biometric school of statistics and social biology. Naturally, the explanations I offer have their difficulties, and, perhaps, foremost amongst these is that of explaining the *particular* pattern of Pearson's response to the stimuli of his early life. After all, in human affairs, the same set of stimuli do not always call forth the same response: here I explore the possibility of explaining Pearson's making the sort of response that he did in terms of the natural 'interests' of persons occupying his sort of social role in later Victorian society. Such a strategy has severe difficulties and these are finally made very clear.

1. BIOMETRY AND STATISTICS

(a) General background

Biometry was a construct of England of the late 1890s, and to a degree to be determined, reflected its circumstances, some of which were as follows.

In 'scientific' England, in the home of Darwin, relatively little work had been done on the mechanism of evolution — on the physiology of heredity and variation and the action of natural selection, for example.[9] Academic biologists, by and large, had tended to devote their energies to the establishment of the historical evolutionary relationships connecting different groups in the plant and animal kingdoms. Statistics, insofar as it was an *institutionalized* concern, was basically non-mathematical, despite the existence of good work by Venn, Marshall, Edgeworth and others.[10]

British social thought of the period contained several streams which we shall see to have been relevant to the development of Pearson's statistical work. The 1880s saw the onset of various types of socialist thought.[11] In 1881 Henry George came to England: in the following year Hyndman set up the Social Democratic Federation, and, in 1883, the Fabian Society was inaugurated. All of this was played out against a growing recognition of the rottenness of urban England. 1883 saw the publication of *The Bitter Outcry of Outcast London,* revealing the conditions of the sub-proletariat, who were to feature in Charles Booth's *Life and Labours of the People in London* as the 'very poor'. 1890 saw the appearance of William Booth's *In Darkest England and the Way Out.* 1884, 1886 and 1887 saw large civil disturbances, deeply worrying to the English middle classes. At about the same period we find Bradlaugh making a reputation on the strength of atheism, Besant facing prosecution for issuing a tract on birth control, and good popular audiences for the lay sermons of scientific populists like Tyndall, Clifford and Huxley.[12] Social Darwinism was a popular genre of thought, with Darwin's ideas being adapted in many directions to suit the preference of the adaptor.[13] Some thinkers still followed Spencer in seeing Darwin's work as underpinning a social philosophy of individualism and competition, but others (as we shall see) now read a more collectivist message from the pages of the *Origin of Species.* T.H. Huxley, typically, threw doubt on the value of any such process of extrapolation from nature to man.[14]

In the 1890s, Francis Galton was one of Britain's leading 'men of science'. As several authors have pointed out, he was a man motivated by strong eugenic views, a man whose attempts to understand human heredity were inspired by the hope of showing the dominance of nature over nurture; and this, in turn, led him to uncover certain crucial statistical notions — notably those of a distribution of variations, of correlation and of regression. Before 1900, Galton was able to attract only a small following for eugenics, which remained more of a catalyst to research than a social movement. But, as several authors have noted, the events of the Boer war, coming as they did in a period occupied with a 'quest for national efficiency', were to pave the way for a strong popular interest in eugenics in the first decade of the twentieth century.[15] As early as 1913, the *Daily Sketch* was splashing the birth of Eugenette Bolce, Britain's — indeed, Hampstead's — first 'eugenic baby'.[16]

(b) Intellectual structures

Let us now pass from the background to biometry to the subject itself. Statements of its aims were common in the literature, but it may conveniently be regarded as a discipline which applied mathematics to the study of the variations found among the members of large populations, including human populations. Perhaps *the* standard statement of biometric problems is one due to Weldon, published first in 1893:

> The problem of animal evolution is essentially a statistical problem: that before we can properly estimate the changes at present going on in a race or species we must know accurately (a) the percentage of animals which exhibit a given amount of abnormality with regard to a particular character; (b) the degree of abnormality of other organs that accompanies a given abnormality of one; (c) the difference between the death rate per cent in animals of different degrees of abnormality with respect to any organ; (d) the abnormality of offspring in terms of the abnormality of parents and vice-versa. These are all questions of arithmetic; and when we know the numerical answers to these questions for a number of species, we shall know the direction and rate of change in these species at the present day — a knowledge which is the only legitimate basis for speculations as to their past history and future fate.[17]

The statistical developments which the pursuit of these and related biometric problems led Pearson to were nicely summarized by the sociologist S.A. Stouffer in a paper which conveys something of Pearson's personal magnetism — one, it should be said, that could attract or repel, but was a strong force in either case.[18]

> I wish I could communicate to you, and especially to those of you who are just now beginning your professional careers in a world of statistics incredibly more sophisticated than that of Karl Pearson's day, something of the thrill in meeting in person and studying under a man of Pearson's immense reputation. Author of the *Grammar of Science;* perfector of simple linear correlations; inventor of multiple and partial correlation, of curvilinear correlation, of tetrachoric and bi-serial correlation; discoverer of the χ^2 function for summarizing multinomial data with magnificent simplicity; builder of a beautiful system of frequency curves derived from a single differential equation which in turn harked back to the hypergeometric series; founder of *Biometrika* and author or co-author of a prolific literature applying thse new statistics to biological and sociological data — Karl Pearson was a hero of Asgard to an American boy vouchsafed a visit to the home of the gods. Indeed, Pearson was Thor himself — for the thunderbolts with which he attacked unsparingly those who dared oppose him were echoing and reechoing.

Why, one asks, did the study of biology, albeit of mathematical biology, lead to such results? Certainly, they are not the inexorable consequence of the successful application of mathematics to evolutionary biology, as readers of D'Arcy Thomson's *On Growth and Form* will appreciate.[19] The answer, I wish to suggest, resides in the circumstance that, for Pearson, biometry was a branch of biology which stressed very heavily the importance of exact measurement and exact description, *without theory,* of the observable phenomena of evolutionary biology. To see this point it is useful to consider a particular example, namely that of Pearson's study of heredity which led to the massive developments in the theory of correlation itemized by Stouffer above. As such, heredity is a particularly good choice, for, as Stouffer's passage indicates, Pearson's work in statistical theory was focused very strongly upon the theory of correlation; and it would appear that this was no accident, as Pearson's statement of the aims and goals of statistics ran as follows:

> The purpose of the mathematical theory of statistics is to deal with the relationship between 2 or more variable quantities without assuming that one is a single-valued mathematical function of the rest. The statistician does not think a certain x will produce a single-valued y; not a causative relation but a correlation. The relationship between x and y will be somewhere within a zone and we have to work out the probability that the point (x,y) will lie in different parts of that zone. The physicist is limited and shrinks the zone into a line. Our treatment will fit all the vagueness of biology, sociology, etc. A very wide science.[20]

Galton had developed the notions of correlation and regression whilst studying heredity in man, but in doing so, he always linked his statistical investigations with exercises in theorizing about the physiology of heredity — about the underlying biological mechanisms that might be responsible for the patterns of correlation and regression which he observed.[21] Pearson had absolutely no time for such a combined approach. Science, for him, was the stern business of observation and measurement, and he stressed heavily what is now termed 'operational definition'. The thrust of his approach may be gauged from the following Pearsonian definition of the problem of heredity.

> *Heredity.* Given any organ in a parent and the same or any other organ in its offspring, the mathematical measure of heredity is the correlation of these organs for pairs of parent and offspring . . . The word organ here must be taken to include any characteristic which can be quantitatively measured.[22]

Pearson's goal was a phenomenal theory of heredity lacking any theoretical mediation (such as Galton's ideas on hereditary particles). Given his chosen mathematical measure of heredity, it is unsurprising that biometry should have led to the developments in theory mentioned above. Let us take a particular example — namely, Pearson's development of the theory of multivariate normal correlation. This was first presented in a memoir of 1896 in which he investigated contemporary claims that a relaxation of natural selection would put evolution into reverse.[23] This, of course, was a view that could be supported by citing Galton's observation that sons regressed linearly upon fathers in respect of stature with a coefficient of regression of about one third. This suggested that if an 'improved' population deviating from an original population mean stature by z inches was allowed to reproduce without the operation of selection, then successive generations of posterity would show z/3, z/9, z/27 inches of deviation, and so on. Pearson was anxious to combat this view, and while I prefer to discuss his motivation for so doing at a later point in the paper, it is worth pointing out that even at this early stage the social and eugenic side of biometry was present in Pearson's published works.[24] For, while he treats this problem of regression quite generally, he does make it clear that the human situation is of most concern.

Galton, of course, was familiar with the bivariate normal distribution — for that, in good approximation, is the distribution followed by parental and filial statures taken jointly.[25] Pearson now, in an attempt to construct a model allowing for the influence of ancestry more distant than the immediate parentage, developed an expression for the joint distribution of n normal variates — an expression, that is, for the multivariate normal correlation surface. He hoped that it would transpire that the values of the various correlation coefficients connecting different degrees of ancestry would be such as to yield multiple regression equations which indicate that when a line of ancestry had been *long* selected (that is, if the grandfather and the great grandfather and so on had been exceptional as well as the immediate parentage), then regression of the sort observed by Galton among the general population would no longer occur. This, indeed, was the start of Pearson's work on the 'law of ancestral heredity', which deserves separate treatment.[26] All that matters for the moment is that the very significant step of developing the theory of multivariate normal correlation arose from a concern with a biological problem and from a determination to treat the problem in a particular way. Interestingly, in the same paper Pearson showed that the best value of correlation coefficient (ρ) of a bivariate normal distribution is given by the formula now said to give the 'sample product moment coefficient of correlation.'

We can see therefore that Pearson's massive developments of the statistical theory of correlation, the branch of his work that he invested with the highest significance, orginated in his theory-free approach to heredity. He wished to make probabilistic predictions about the outcome of a line of ancestry without the necessity of discussing underlying mechanisms of heredity. This was quite out of step with contemporary biological practice, which was, if anything, a great deal more interested in getting to grips with the underlying physiology of heredity than in the sheer business of prediction. But, said Pearson, on the eve of the rediscovery of Mendel's ideas, the would-be physiologists were like

> planetary theorists rushing to prescribe a law of attraction for planets, the very orbital forms of which they have not first ascertained.[27]

It was in this way that the advantage of biometry led to developments in statistical theory — a circumstance, of course, that it is quite consistent with the mathematics, once embarked upon, 'taking up a life of its own': issues like those of the sampling distribution of the correlation coefficient then 'arose naturally' and had to be dealt with. But the point remains that the search for a new mathematical science of heredity, for a science of a particularly austere sort, led to developments in statistical theory.

Correlation looms large in Pearson's work, and this should not surprise us, having seen his definition of the purposes of statistics. But, as Stouffer showed, Pearson's work was not exhausted by his labours in the field of correlation. Other aspects of his work also arose in a biometric context, and it is not too much to say that they reflect an approach to science with a massive emphasis on the production of *mathematical ways of describing observable phenomena,* and on ways of checking up on the goodness of the description. Thus, for example, Pearson's first biometric paper was devoted to developing a method for deciding whether a particular assymetrical frequency curve found by Weldon when sampling crabs could be resolved as the sum of two normal distributions.[28] His second paper developed the series of Pearson curves as a way of describing non-symmetrical and unresolvable distributions of (biological) data.[29] And, generally, if the correlational part of Pearson's work stemmed from a desire to find theory-free connections between different sets of data, then the aim in this other part of his work seems to have been to find ways of accurately describing any given set of data — notably by fitting a curve to it. Not all of Pearson's early statistical developments can be seen as the direct outcome of attempts to deal with specific biological problems, but they can, I think, be reasonably seen as more general developments jibing with the aims for biometry (and, more generally, for science) noted already in Pearson's approach. The chi-squared goodness of fit test, for example, developed in 1900, is surely a good instance.[30] It is not that if we know Pearson's aims for science, his insistence on mathematical representation of the phenomena as the major goal, then we are led to the test. That is where his genius came into play. Rather, it is that if we understand these aims and goals we can see the attraction, for him, in pursuing such a mathematical investigation.

(c) Questions of method

The remarks just made about the methodological style of biometry may be supported by going to texts, to Pearson's methodological writings which were largely completed before his entry into biometry. They were most widely publicized in his *Grammar of Science,* first published in 1892.[31] Given the aims and goals of biometry at the level of methodology we can, I hope, see why and how biometry led on to statistics. What I wish to suggest now is that it is no surprise that biometry had these aims and goals, for they came directly out of Pearson's already formed methodological ideas. These, interestingly, were ones that he could develop and enhance as he developed his statistical thought.

In the three editions of the *Grammar* (1892, 1900, 1911) we find a philosophy of science which resembles some of the views of the later Logical Positivist school of philosophy. In a doctoral thesis Chauncey Riddle has discerned three main components to Pearson's epistemological writings, namely 'empiricism, a Kantian emphasis on the role of the mind in organising and interpreting sensation, and a Cartesian faith in mathematics as the key to organised scientific thought'.[32] The *Grammar,* Riddle notes, is 'largely an attempt to impress the ideas of Mach upon the English speaking world'. This seems entirely correct; Pearson was an instrumentalist and a sensationalist, a man who denied the possibility of getting to grips with the *Ding an sich* and who expressly ruled out the possibility of a fruitful metaphysics. Metaphysical speculation, he in effect said, was meaningless. Objects, in this philosophy, were mental constructs out of sense data, and what so fascinates one about this aspect of Pearson's thought is his Kantian emphasis on the possibly active power of the mind in creating experience. For he wrote that

> it may be the perceptive faculty itself, which, without being directly conscious of it, contributes the ordered sequence in time and space to our sense impressions. The routine of perceptions may be due to the recipient and not characteristic of the material.[33]

Any connection, through experience, between the self and the real world was therefore highly tenuous, and the only goal for science that made sense was an instrumental one. One could not learn about underlying realities, and the postulation of a realist ontology of atoms, molecules and so on was, in this philosophy, rendered incoherent or redundant. All that science could do was to uncover laws that summarized the flow of phenomena and functioned as instruments of prediction, whose ultimate rationale lay in the enhanced potential for survival that they offered in the evolutionary struggle. This they did best when they partook of the economy and precision granted by expression in *mathematical* form. Pearson, clearly, saw biometry as an exemplar of his philosophy put into operation. He saw himself as finally ridding biology of its traditional metaphysical integuements, and took pains to introduce two new chapters on biometry in the second edition of the *Grammar*.

Biometry, clearly, was a natural Pearsonian research programme and, it should also be clear, the statistical methods emanating from it must be seen as the mathematical encapsulation of a philosophy of science Pearson had developed before taking up biometry. Good Cartesian that he was, statistics offered a mathematical way of economically describing the flow of appearances in the non-physical sciences. But, good Kantian that he was in other respects, statistics offered the makings of a philosophical revolution which could be carried forward as his work in biometry and statistics grew. As his contributions to the theory of correlation became more refined, Pearson took to suggesting that this work was philosophically profound. For it showed that the great Kant had been wrong in asserting that determinism was a precondition for human experience.[34] What was needed, Pearson wrote, was the kind of semi-determinism that the statistical methods of correlation were adapted to handling. The category under which experience fell was not deterministic causation, but, rather, the looser framework now describable via the mathematical theory of correlation. All scientists, he thundered, should desist from trying to conceptualize the world under the category of causation. Instead, they should adopt the new category implicit in his own work, namely that of correlation, under which

> all our experience whatever of the links between phenomena can be classified.[35]

All of the foregoing, I hope, lends support to the thesis that biometry begat statistics on account of its peculiar methodological form. This, by turn, was due to the circumstance that before meeting Weldon, Pearson had worked out a distinctive epistemology and methodology for science. In particular, the Kantian tinge of this philosophy made it possible for Pearson to see his work in correlation as being philosophically significant — a feature which undoubtedly sustained his interest in correlation and all its possible ramifications.

2. SCIENCE, SOCIALISM AND SOCIAL DARWINISM

I now come to the problem of why it was that fifteen years after graduation, after a period in which he had done no biological work at all, Pearson should have been prepared to embark upon a new career in biometry when tackled by Weldon in the early 90s. One response, seemingly that of J.B.S. Haldane, is that Pearson's decision to move in a biological direction rather than some other, and his founding *Biometrika* rather than, say, *Technometrika,* were largely accidents of fate: it just happened to be Weldon, a biologist, who wished for assistance.[36] It seems to me that such an approach is implausible, for it undervalues the magnitude of Pearson's response. This may be gauged from the following bibliographical statistics.[37] In the period up to 1894 (that is, Pearson's 'pre-biometric' phase), Pearson published 55 items listed as 'Literary and Historical' in the official bibliography of his works; thereafter he published only a further 10 items so classified. The period after 1894 contained 405 items listed as 'Statistical'. Moreover, the section headed 'Pure and Applied Mathematics and Physical Science' contains 4 items in the period to 1894, and 32 thereafter, suggesting a more or less uniform rate of productivity in this area. In short, there does seem to have been an amazing turn-about in Pearson's pattern of work, as if biometry had the power to absorb the interests that were previously being discharged in the production of literary and historical work. We must ask why this change occurred.

It is this turn-about by Pearson that I now address, but not before stressing that it would be wrong to see Weldon's role as an overly simple one. Weldon may have led Pearson to use and develop methods pioneered by Galton, but we have to explain why it was that Galton's works did not speak to Pearson unmediated by Weldon. Indeed, things are more difficult even than this, for Pearson had encountered Galton's *Natural Inheritance* at the date of its publication in 1889, and had given a talk upon it to a Men and Women's Club of which he was then a member. (I shall return to this club in the next section of the paper.) In his talk, Pearson gave a less than fulsome account of Galton's methods:

> Personally I ought to say that there is, in my own opinion, considerable danger in applying the methods of the exact sciences to problems in descriptive science, whether they be problems of heredity or of political economy: the grace and logical economy of the mathematical processes are apt to so fascinate the descriptive scientist that he seeks for sociological hypotheses which fit his

> mathematical reasoning and this without first ascertaining whether the basis of his hypothesis is as broad as that human life to which the theory is to be applied. I write therefore as a very partial sympathiser with Galton's methods.[38]

And, in his copy of Galton's book, Pearson pencilled in his exasperation with Galton's style of argument. On page 30, for example, he wrote, testily, that

> It is merely an analogy without any scientific value as to the *how* still less to the *why*.[39]

Yet, later on, Pearson recalled that he had interpreted the introduction to *Natural Inheritance* to mean that

> there was a category broader than causation, namely correlation, of which causation was only the limit, and that this new conception of correlation brought psychology, anthropology, medicine and sociology in large parts into the field of mathematical treatment. It was Galton who first freed me from the prejudice that sound mathematics could only by applied to natural phenomena under the category of causation.[40]

Clearly, Weldon acted as a middleman, able to reinterpret Galton's statistical approach to biological matters in a manner that harmonized with Pearson's stern methodological criteria. Certainly, in the statement of problems due to Weldon, and in Weldon's early work, we find none of the analogical reasoning and physiological theorizing that Pearson so disliked in Galton's work.

But, if we accept that some methodological refining was necessary if Pearson was to take the biostatistical bait, so to speak, there remains the issue of explaining his subsequent total devotion to biostatistical inquiry, his new devotion to biological inquiry. One still wishes to know *why* Pearson was so prepared to dive into biological and evolutionary issues fifteen years after graduating as a mathematician. In the remainder of this section, I shall try to show that by the time of his meeting with Weldon, Pearson was intellectually primed to take up just the investigations that he did. In the final section I shall address the issue of how he came to be so primed.

It should be remembered that Pearson's philosophy of science was also a philosophy of life. It is no surprise to learn this when one recalls that Pearson's ideal was the freethinker, the abider by the 'ethic of freethought'. This person would have 'assimilated the results of the highest scientific and philosophical knowledge of the day', he would be a 'sound citizen', trained in the 'impersonal judgement' criteria of the scientific intellectual: he would be able to assess, for example, the views of Weismann on the continuity of the germ plasm and to employ this judgement when considering the right conduct of society towards its 'anti-social members'. This, Pearson averred, would remain an open question until one knew 'what science has to tell us on the fundamental problems of inheritance'. Quite generally, Pearson wrote, in the *Grammar,*

> each one of us is now called upon to give a judgement upon an immense variety of problems, crucial for our social existence. If that judgement confirms measures and conduct tending to the increased welfare of society, then it may be termed a moral, or better, a social judgement. It follows then that to ensure a judgement's being moral, method and knowledge are essential to its formation. It cannot be too often insisted upon that the formation of a moral judgement — that is one which the individual is reasonably certain will lead to social welfare — does not depend solely on the readiness to sacrifice individual gain or comfort, or on the impulse to act unselfishly: it depends in the first place upon knowledge and method. The first demand of the state upon the individual is not for self sacrifice, but for self improvement.[41]

And, as one reads further into the pages of the *Grammar,* it becomes clear that what Pearson means by 'increased welfare of society' is not some Benthamite entity, but, rather, something crucially related to ideas like those of 'national survival and supremacy in the inevitable international competition for existence'. Pearson, indeed, is known to social historians as a key promoter of 'external' social Darwinism, of the doctrine that the correct way of envisaging the struggle for existence in human affairs is not at the level of man against man, but at that of nation or race against nation or race, with success going to the best organized group. 'The growth of national and social life', Pearson wrote,

> can give us the most wonderful insight into natural selection, and into the elimination of the unstable on the widest and most impressive scale.[42]

So, for Pearson, morality was dictated by considerations of what would be of avail to a society in its necessary struggle with other societies, and it is in this context that the defence of socialism appears in Pearson's work — though, as we shall see, his style of socialism was distinctive. Socialism, by which he meant the 'tendency for social organisation, always prominent in political communities', could be justified by its power to bestow success in the 'intense struggle which is ever waging between society and society'. The lesson of history was the lesson of socialism, and science would ultimately balance 'the individualistic and socialistic tendencies better than Haeckel and Spencer seem to have done'. Certainly,

> in the face of the severe struggle, physical and commercial, this fight for land, for food and for mineral wealth between existing nations, we have every need to strengthen by training the partially dormant socialist spirit, if we as a nation are to be among the surviving fit.[43]

This new pattern of organization, said Pearson, must 'largely proceed from the state'.

> Here it is that science relentlessly proclaims: a nation needs not only a few prize individuals; it needs a finely regulated social system — of which the members as a whole respond to each external stress by organized reaction — if it is to survive in the struggle for existence.[44]

And, quite generally, if we look at his writings produced by the time of his meeting with Weldon, we can see that Pearson's social and ethical thought had a thoroughgoing Darwinian form. It certainly included commitments to the following propositions.[45]

(i) History must be understood in terms of the principles of Darwinian evolution. At this stage it may become a science, a biological determinism to rival historical materialism.

(ii) In important practice, the Darwinian struggle for existence in history goes on between group and group, with different social mores waxing and waning in influence according to their power to assist the group in its inexorable struggles.

(iii) The ultimate legitimation of morality has to be sought in the biological standard of group survival. Only with a people attuned in their outlook, showing Clifford's 'tribal conscience', could there be built up a society with 'permanent stability'.

(iv) On scientific grounds, therefore, the proper goal for the members of a society is the production of 'a finely regulated social system' enabling it best to survive in the struggle and to emerge 'among the surviving fit'. The best way to achieve this was a move to a form of state socialism, run by talented experts.

By now, I suggest, we should be able to see why work in evolutionary biology could so attract Pearson; why he was, so to speak, 'primed' to respond to Weldon. We can see too, at least in outline (an outline to be filled in in the next section), why eugenics could so attract him — for eugenics was just the branch of evolutionary biology that could be deployed to maximize the fitness of the socialist state envisaged by Pearson. No wonder we find that, in 1894, Pearson could write that it would only be when mathematical work on the 'relative numerical importance of the several factors of natural selection' had been completed that it would be time to talk about 'the antagonism of socialist theory to biological laws'.[46] Clearly, he was anticipating the results of work that, he would hold, showed that laissez-faire in reproduction led, not as Spencer had predicted, to sociobiological advance, but, in fact, to the proliferation of the unfit at the expense of the professional middle classes.[47]

Certainly, this general perspective — namely that Pearson was prepared to work in a biological field when approached by Weldon because his thought was already steeped in Darwinian notions needing, given his philosophy, mathematical development — may be supported powerfully by autobiographical evidence. This takes the form of a letter which Pearson wrote to the *Manchester Guardian* in 1901, replying to its review of his recent work, *National Life from the Standpoint of Science.* The latter was a gloomy and aggressive jeremiad which had presented a 'scientific' view of the nation as

> that of an organised whole, kept up to a high pitch of internal efficiency by insuring that its numbers are substantially recruited from the better stocks, and kept up to a high pitch of external efficiency by contest, chiefly by way of war with inferior races, and with equal races by the struggle for trade routes and for the sources of raw material and food supply. This is the natural history view of mankind, and I do not think you can in its main features subvert it.[48]

In his letter, Pearson took great pains to rebut the *Guardian's* charge that he was just another politically ignorant biologist turning his microscope to the world of affairs with the usual disastrous consequences. What grounds, he inquired, did the reviewer have for supposing

> that I may not have spent more years of my life in historical work than in the study of heredity; that I may not possibly have laboured more carefully at history than at biology; that more of my published work may not deal with the former rather than the latter; nay that even my endeavour to understand something of inheritance and of racial struggle may not have arisen from my attempts

> to read history aright? May it not be that I am convinced that through the principle of evolution by natural selection combined with inheritance, light alone can be thrown on that maze of wars, movements, national survivals and national decays which passes for history in our current textbooks? Is it not just possible that a man who has thought and worked in the historical field may have turned to the biological field because he has been driven by the force of facts to see that the keynote to the history of man lies in the struggle for food and in the struggle to reproduce, which are the great factors at the base of all biological reasoning with regard to the development of animal life? I ask what reason you have for supposing my history an outgrowth of 'biological consciousness' rather than that my interest in heredity has arisen from my conviction of its bearing on historical studies.[49]

Here, it seems plain, we have the source of Pearson's preparedness to enter the field of evolutionary biology.

3. SCENES FROM A VICTORIAN LIFE

If the foregoing analysis is approximately correct, and it is accepted that Pearson's readiness to enter into biometry and the power of biometry to produce statistics linked to eugenics can be understood in terms of the social, ethical and epistemological ideas which Pearson had developed prior to his meeting with Weldon, then there remains the task of explaining how it is that he came to have this intellectual disposition. It is to this task that I now turn, and I shall proceed by discussing Pearson's development during his 'pre-biometric' phase — that is, the period in which he was an undergraduate, a fellow of King's and a London-based intellectual. As the section develops it should be possible to clarify the exact nature of Pearson's 'non-scientific' thought.

(a) Cambridge

The roots of Pearson's philosophy of science and social Darwinism may first be sought in his undergraduate years at King's College Cambridge. Here he met Robert Parker the future law lord,[50] Henry Bradshaw the librarian, Macaulay the mathematician and Oscar Browning the historian. Then, as ever, he looked for a few close friends, and was especially close with Parker.

Like many undergraduates, Pearson did not enjoy a carefree life. His 'Commonplace Book' for 1877, for example, suggests a state of mental turmoil which led him to a piece of self-analysis in which he attempted to clarify his views on religion 'till I was left with some definite idea of what religious belief I have or whether I have any at all'. His answer was vague and rambling, but showed clearly enough a growing contempt for laissez-faire society and for Christianity.[51] At times, he wrote, he could believe in a God, but not when he encountered the poverty of Victorian Britain. Pearson, in short, was a candidate for philosophy (as had been Clifford, Marshall and others before him at similar periods in their development),[52] and his writings portray him as searching for a creed, for some secular religion upon which he could focus the religious feelings so common among Victorians. This comes out more clearly in a letter to Parker, where Pearson wrote that

> since all my religious dogmatic faith fell to the ground, I feel that I can only be happy by adding a mystic ideality to everything, and looking at everything from a religious point of view . . . It is this spirit of the ideal which Carlyle tries to cast over everything and which delights me so.[53]

At this time, Pearson's non-mathematical reading was chiefly in British empiricist philosophy and in German literature — in Goethe, Herder, Schelling and others. Like Carlyle he was an enthusiast for *Wilhelm Meister*. In February 1879 he read Berkeley's works, and at about the same time decided to go to Heidelberg to study philosophy and physics.

(b) Heidelberg

In Heidelberg, doubtlessly, Pearson hoped to find a new philosophy, a new creed that would satisfy his need for something in which to believe. We can garner something of his mood and thoughts from his letters, but also from a book, the *New Werther,* which Pearson published under the pen-name 'Loki'. The *Werther,* Pearson was to claim, was written in a deliberately 'gush style', but nevertheless it tells a great deal about Pearson's time in Germany — for, judging from Pearson's other attempts at fiction, it seems improbable that he had the skill to create a character whose thoughts strayed too far from his own. In the pages of the *Werther* we learn a great deal about his unhappiness in Cambridge, his decision to turn to Germany — the 'country of ideas' — and his love of things German, which was to be reflected in his changing his name from Carl to Karl. In Germany he seems to have developed a mild nature-mysticism and to have kept the company of Raphael Wertheimer, a Jewish law student and radical who features prominently in the *Werther;* there he is depicted as introducing Arthur (the autobiographical tragic hero) to socialism, saying of the English that they

> do not recognise the difference between a French communist, a Russian nihilist, and a German social democrat, but brand them with a common stigma as subverters of society.[55]

Wertheimer, a social democrat, insisted that

> We do not wish a revoutionary change in all old laws and customs; we recognise the truths which history has taught, that real change is gradual, and yet also that change is necessary to life. The violence of some persons claiming to be members of the party is due to the ignorant and vicious whom the leaders cannot prevent from joining their banner.[56]

Clearly, Wertheimer found a convert of sorts in Pearson, who thereafter proclaimed himself a socialist — though, as will become ever more apparent, an élitist state-socialist. This comes out rather clearly in one of the first papers which he wrote after his return from Germany, a short work entitled 'Anarchy'. In this he wrote with genuine horror of the state of London's sub-proletariat:

> Those weak and emaciated beings, weak and feeble as they look, have the power in their millions to throw down the few feet of bricks which guard the arsenals. Those three million could sweep a few thousand police and soldiers before them as the wind blows a handful of chaff.[57]

He was fearsome lest there be an uncontrolled anarchic revolution from below, something he took to be the natural outcome of existing conditions. In its place, Pearson recommended a *gradual* 'revolution' from above, leading to a form of society with 'forms and grades' and with power based not on a financial hierarchy but on a hierarchy of 'power intellectual' which alone would

> determine whether the life-calling of a man is to scavenge the streets, or to guide a nation.[58]

How the transfer was to be effected was unstated, but, Pearson insisted, the new order would need a new religion which would form a real bond 'between class and class, between man and man solely on the score of their manhood'.

Some indication of what this might mean was given in a further paper of the same year, on 'Political Economy for the Proletariat', which attacked traditional political economy and compared the 'individualism of Bentham' unfavourably with the 'socialism of Fichte'. Pearson, clearly, was attached to some of Fichte's ideas, and wrote that in the new order, for which he (Pearson) hoped, the state would be charged with the duty of 'the improvement of mankind', and that in the science that would treat of the organization of the state.

> All the ordinary categories of political economy — capital, labour, land, trade and so forth — must be judged from this new standpoint, and I fear not a few of the results attained will be found to differ from the mammon-worshipping doctrines of Ricardo and his disciples.[59]

The nearest extant approach to what he had in mind, wrote Pearson, again reflecting his German experience, was to be found in the work of the *Katheder-Socialisten* who, under Schmoller, helped frame Bismarck's social policies. In particular, Pearson singled out the ideas of Held and his school, citing their claims and demands with approval:

> They demand that the economic man must also be considered as a member of a state organism, they reject the suggestion of an unusually valid natural law, and demand that each existing judicial system must in whole and part be considered critically as a factor of the greatest importance in the formation of economic relations . . .[60]

It seems therefore that in Germany Pearson picked up what might, somewhat anachronistically, be described as a Spenglerian view of the state, one stressing the desirability of an organic unity with hierarchical ranks and grades bound by feelings of common purpose. Shortly we shall see how this political line of thought developed whilst in London in the period prior to his meeting with Weldon. But, for the present, I would like to pause briefly to trace the early development of Pearson's epistemology and philosophy of science at this period, thinking particularly of his interesting neo-Kantian and instrumentalist perspective upon knowledge.

Returning to Heidelberg, we find that Pearson studied philosophy under Kuno Fischer, but read more widely than was required. By May 1879 he was reading Kant's *Metaphysics of Ethics* as a follow up to the *Critique of Pure Reason,* which he had meticulously studied whilst in Cambridge. By 25 May, Pearson felt able to write to Parker, saying more about his work and rejecting the possibility of a metaphysical foundation for ethical judgement.

> You are certainly right about the foundation of religion not being the pure reason, this Kant I think has conclusively prove in the *Kritik der reinen Vernunft*. In the *Metaphysics of Ethics* and the *Practical Reason,* he attempts to base religion on morality, or a belief in God follows from the necessity of moral order in the Universe. They seem both to me *thoroughly* unsatisfactory. He even contradicts himself by founding his moral system on a moral sense (conscience,

> which is innate and universal), which he asserts *dogmatically* to exist. Is this innate sense the same in the cannibal and the educated man? It is not empirical, according to Kant, and there is no question of its development. If then we can't found religion on morality we are left alone with the emotions, the feeling of want, religiosity, and quite enough too.[61]

Perhaps the sequel to this was not surprising. By 20 June Pearson was writing to Parker, telling of a dinner at which he had told Fischer that philosophy was a vain pursuit, and that he (Pearson) 'felt at a lower ebb of despair with regard to the truth than I have ever felt before in my life'. And, as for truth, it was a dubious affair.

> Let us consider whether it can be a *law of nature*. Does anybody know what we mean by this expression? The more I have studied science and physics, the more I see that we know nothing of what we call nature — of electricity, light and attraction we know nothing. What is the sense of calling light a vibration? Or that gravity is a force between particles of matter varying as the inverse square of the distance? . . . The term was invented some hundred years ago to *describe* a phenomenon which it attempts to *explain*. . . . Besides, the whole tendency of modern philosophy since Kant is to assure us that the so-called laws of nature exist in our minds, are a logical necessity of our minds which impress them on the things themselves for they can only observe things in such relations. Fancy truth a function of that absurd humbug man's mind![62]

Faced with such difficulties, Pearson decided temporarily to abandon the study of philosophy, his reason having been shattered 'by the purely negative results' found in the works of the philosophers. Briefly thereafter he toyed with the idea of going to Berlin, to work in natural science with Kirchoff or Helmholtz; but, by October, Pearson had decided to throw over both physics and philosophy and reluctantly to submit to a career at the bar.[63]

As we have seen, he was to return to philosophy, and would build upon the base, small that it was, that was constructed in Heidelberg — namely his conviction that science described but did not explain; his views on the impossibility of knowing the thing in itself; and his addiction to some of Kant's ideas. Unsurprisingly, Pearson did not favour Kant's metaphysical approach to ethics. We have seen this above, but the full force of his distaste came out in a review of 1883, of one of Fischer's books. In the review Pearson wrote kindly of Kant's *Critique of Pure Reason* but harshly of his ethics. And, thinking doubtlessly of the Hegelian revival in Oxford, he noted that there was in the ethical writings

> an entire change of front, the door is to be thrown open to the whole body of emotionalists, mystics and metaphyical idealists.[64]

Clearly, Pearson was open to a non-metaphysical account of ethics, and, as we have seen, he was to find — or, more accurately, to suppose that he had found — such an account in his Darwinian explorations. Thus, it might be said that once we understand Pearson's intellectual development in Heidelberg we are well on the way to understanding how he came to that intellectual state which made him a candidate for the sort of work in biology that would produce statistics and would ally itself with eugenics. It remains now to consider the remainder of the 1880s, which Pearson spent in London, at first as a lawyer, and later as professor of applied mathematics at University College London.

(c) London and the Men and Women's Club

Back in London, Pearson's thought developed steadily. On the philosophical side we find that in October 1884 publishers asked him to edit and complete the late W.K. Clifford's *Commonsense of the Exact Sciences,* which he was able to publish in 1885. On the social and ethical side he was able to publish a book of collected essays, the *Ethic of Freethought,* in 1887.

In these writings two trends may be discerned. In the *Commonsense,* Pearson developed the epistemological ideas which had begun to crystallize whilst in Germany, ideas bringing him closer to the *Grammar of Science.* While preparing the *Commonsense* Pearson read the works of Ernst Mach, and when contributing his own ideas on the laws of motion was delighted to be able to record that these views seemed to have 'the weighty authority of Professor Mach of Prag'. By 1885, it would seem, the creation of his philosophy of science was almost complete.[65]

Pearson's social, political and ethical thought underwent a more significant development, for we find an increasing introduction of 'Darwinian' ideas when discussing social organization and moral principles. This, perhaps, is unsurprising, for Darwin's ideas were then on everyone's tongues. It is hard to say precisely where Pearson's own style of Darwinism came from, but we do know him to have been a keen student of the writings of Clifford and there is much in Clifford's essay on 'The Scientific Basis of Morals' that found its way into Pearson's thought. Certainly, he deployed Clifford's idea of a 'tribal conscience'.[66]

The drift to Darwinism is clear enough in the essays that make up the *Ethic of Freethought*. By 1885, in fact, most of his Darwinian ideas seem to have been formed, and may be discerned in his essay of that year on 'The Woman's Question'. Here, when discussing womens' rights, he insisted that a decision about the woman's proper social role should be consequent upon an analysis of the effects of any proposed role on national fitness.

> We have first to settle what is the physical capacity of woman, what would be the effect of her emancipation on her function of race-reproduction, before we can talk about her 'rights', which are, after all, only a vague description of what may be the fittest position for her, the sphere of her maximum usefulness in the developed society of the future. The higher education of women may connote a general intellectual progress for the community, or, on the other hand, a physical degradation of the race, owing to prolonged study having ill effects on woman's child-bearing efficiency.[67]

And, by 1887, judging from a paper on 'Socialism and Sex', the Darwinian perspective seems to have become total. In this essay we find Pearson outlining all of the theses discussed in Section 2 above, insisting, for example, that

> the moral or good action is that which tends in the direction of growth of a particular society at a particular time.

that

> Herder attempted a philosophy of history on the basis of metaphysics and naturally failed. The philosophy of history is only possible since Darwin, and the rationalisation of history by the 'future Darwin' will consist in the explanation of human growth by the action of physical and sexualogical laws in varying human institutions.

and that

> we are students of history, not because we are socialists, but socialists because we have studied history.[68]

The style of socialism which he advocated was taking clearer shape, but along the lines outlined in the paper on 'Anarchy' discussed above. In Pearson's socialist state, in the state whose structures he increasingly supported by Darwinian rhetoric, persons like himself, 'labourers with the head' as he called them, would play a pre-eminent role. This was made quite clear at several points.[69]

Pearson's growing interest in and commitment to sociobiological studies was reflected in his formation, along with Parker, of a 'Men and Women's Club'. The secretary of the club was Maria Sharpe, his future wife. By looking at some of the activities of the club we shall, I think, see finally and clearly why and how, by the early 1890s, Pearson was able to plunge into biometry and to link it with eugenics.

The club was established in 1885, by Pearson, Parker, Elizabeth Cobb (wife of Cobb the MP) and her sisters Maria and Laetitia Sharpe, for the purpose of frank discussion of the relations between men and women. It was a select middle class group, anxious to avoid scandal, whose members were, by and large, just the sort of people one might expect to find joining the new Fabian Society.[70] Members, proposed members and guests included Annie Besant, Havelock Ellis, Olive Schreiner, Eleanor Marx and Mrs Wilson the Hampstead anarchist. Mrs Wilson, interestingly, had written to Pearson in the previous year asking him whether he would care to join her, Sidney Webb and others in a reading of Marx's *Capital.*[71]

The thirty-six meetings of the club covered a wide range of topics: prostitution, then an outrageous scandal; the relative sex drives of men and women; and, above all, patterns of sexual relations in contemporary and defunct societies. In these surroundings Pearson's interest in the biological basis of national fitness increased, and we find for example that in contemporary writings he referred to the right to bear children as a sacred one, and inquired if, in 'a better organized society than the present',

> it would not be fitting that either the state should have a voice in the matter, or else that a strong public opinion should often intervene? Shall those who are diseased, shall those who are nighest to the brute have the right to reproduce their like? Shall the reckless, the idle, be they poor or wealthy, those who follow mere instinct without reason, be the parents of future generations? . . . Out of the law of inherited characteristics spring problems which strike very deeply into the roots of our present social habits.[72]

By 1889, the Club was coming apart from flagging interest, but Pearson introduced Galton's *Natural Inheritance* to a final meeting, criticizing (as we have seen) its methodological structure. But what, perhaps, is of the greatest interest is his conviction, mentioned in Section 1, that the regression observed by Galton in the general population would not hold for long-selected lines. And said Pearson, in one of the Club's closing meetings,

> I am not advocating a return to group or even to close intermarrying, but a far more careful sexual selection on the part of those members of the community who have a large deviation physically or mentally from mediocrity.[73]

Here, it seems, is laid bare the basis of Pearson's preparedness to enter biological work. By 1890 several ideas were converging. Pearson had adopted a Darwinian historicism to justify his state socialism, and, as we can see, his interest in national fitness was moving on from issues of organization to issues of biological efficiency: already he was concerned with eugenic problems, as well as the more general issues of evolution. In the period up to 1890, therefore, we can see the emergence of a framework of thought that would make biometry an attractive proposition, which would make it a science likely to produce statistical results which could be prized for their philosophical significance, and which could be used in eugenic investigations. This should be seen as another phase of Pearson's socialism, with its emphasis on national fitness and the production of a socialist élite class of administrators of the highest quality.

CONCLUSION

I have depicted a pattern of intellectual growth and change on Pearson's part, reflecting in various ways the late-Victorian tide of secularism and religious doubt after the advent of Darwin, and concerns for the urban proletariat. Pearson, one might say, responded in various ways to the conditions of his life. But to say this is only to invite the further question of why he responded in the manner that he did. Why, one wonders, did he not perhaps become a Christian socialist, or, like the respectably born Hyndman, a revolutionary? Why, in philosophy, did he tread the Machian path when others did not? Why should he have become a Darwinian in ethics when Huxley was inveighing against such moves?

Possibly some answers may be obtained by studying Pearson's social position and the natural interests arising from it.[74] He was a brilliant intellectual with no investment in land or capital, with friends similarly located in the 'nouvelle couche sociale' which Hobsbawm has seen the Fabians as inhabiting.[75] Up to a point, therefore, it may be possible to see Pearson's élitist socialism as a reflection of this position — for, certainly, it was a form of social organization in which he and his circle would play esteemed roles. His sensationalist philosophy might perhaps be similarly interpreted, as one that eliminated the clergy from the sphere of rational influence and entrenched a new class of scientifically trained persons, again like Pearson. The eugenics concerns may perhaps be seen as jibing with the natural interests of such persons, for it gave a biological foundation to their supremacy.

In short, we can see that many of Pearson's ideas appear to be enhancing the esteem of the group with whom he identified. Whether or not such a harmonization can be seen as explaining his espousal of these ideas is, it seems to me, a question that brings us hard against the philosophical difficulties inherent in explaining an individual's thought in terms of the interests of a group to which *he has attached himself.* Perhaps it is unwise to take this issue on at this point. It needs separate treatment. Possibly the case of Pearson and statistics could serve as a useful reference in such discussions.

• *NOTES*

I would like to acknowledge gratefully financial assistance from the UK SSRC whilst preparing this paper. I would also like to thank Professor E.S. Pearson for permission to use the Pearson papers.

1. For the best biography of Pearson, see E.S. Pearson, *Karl Pearson: An Appreciation of Some Aspects of his Life and Work* (Cambridge: Cambridge University Press, 1938). For an account of Pearson's social Darwinism, see Bernard Semmel, 'Karl Pearson: Socialist and Darwinist', *British Journal of Sociology,* Vol. 9 (1958), 111-25. The best account of secondary literature on Pearson is contained in Churchill Eisenhart's article on Pearson in the *Dictionary of Scientific Biography,* Vol. 10 (New York: Charles Scribner's Sons, 1974).

2. The pattern of development of Pearson's writings may be discerned in G.M. Morant, *A Bibliography of the Statistical and Other Writings of Karl Pearson* (Cambridge: Cambridge University Press, 1938).

3. The fullest biography of Weldon is Pearson's paper 'W.F.R. Weldon, 1860-1906', *Biometrika,* Vol. 5 (1906), 1-50.

4. For an account of Pearson's involvement, see his biography of Weldon, ibid. note 3. See also K. Pearson, *The New University for London: A Guide to its History and a Criticism of its Defects* (London: T. Fisher Unwin, 1892).

5. Eisenhart, op. cit. note 1, 450.

6. An excellent account of some of the stages involved in the setting up of the department may be had in Lyndsay Farrall, 'The Origin and Growth of the English Eugenics Movement 1865-1925' (unpublished PhD thesis, Indiana University, Bloomington, 1970), available from University Microfilms.

7. Good discussions of the students of Pearson's department are to be found in Farrall, ibid.

8. The impact of Pearson's methods on psychology, for example, was significant especially in the area of the study of individual differences. See B. Norton, 'Charles Spearman and the Doctrine of 'g': Genesis and Interpretation',

forthcoming in the *Journal of the History of the Behavioural Sciences.* For the citation, see E.S. Pearson, op. cit. note 1, 119.

9. It should be recalled that, before the 1870s, there was very little biological research done in the English Universities, and that, at Cambridge, for example, experimental work was seriously introduced only after the appointment of Michael Foster to a praelectorship of physiology at Trinity College in 1870. His protégé F.M. Balfour started England's leading school of evolutionary biology, and as may be seen by inspecting Balfour's masterful *Treatise on Comparative Embryology,* 2 Vols. (London: Macmillan, 1880-81), the paradigm of this school was one of phylogenetic morphology.

10. The best general study of the history of statistics is, perhaps, H.M. Waller, *Studies in the History of Statistical Method* (Baltimore, Md.: Williams and Wilkins, 1929). The generally non-mathematical tenor of institutionalized statistics prior to 1900 may be seen by inspecting the volumes of the *Journal of the Royal Statistical Society* for that period.

11. For details put in a way relevant to this paper see Bernard Semmel, *Imperialism and Social Reform: English Social-Imperial Thought, 1895-1914* (London: Allen and Unwin, 1960).

12. Perhaps the best account of the radical London intelligentsia of the period is to be had in W.S. Smith, *The London Heretics 1870-1914* (New York: Dodd Mead and Co., 1968). See also G. Stedman-Jones, *Outcast London* (Oxford: The Clarendon Press, 1971).

13. For a good discussion of social Darwinism, see G. Himmelfarb, *Victorian Minds* (London: Weidenfeld and Nicolson, 1968). See, in particular, Chapter 12, 'Varieties of Social Darwinism'.

14. See T.H. Huxley, 'Evolution and Ethics', in *Evolution and Ethics* (London: Macmillan, 1911), 46-116. This chapter was based on Huxley's Romanes Lecture for 1893.

15. For an account, see D. MacKenzie, 'Eugenics in Britain', *Social Studies of Science,* Vol. 6 (1976), 499-532.

16. See the *Daily Sketch* (3 October 1913).

17. W.F.R. Weldon, 'On Certain Correlated Variations in Carcinus Moenas', *Proceedings of the Royal Society, Series A,* Vol. 54 (1893), 329.

18. S.A. Stouffer, 'Karl Pearson — An Appreciation on the 100th Anniversary of His Birth', *Journal of the American Statistical Association,* Vol. 53 (1958), 23-27, esp. 23.

19. See Ruth D'Arcy Thompson, *D'Arcy Wentworth Thompson* (London: Oxford University Press, 1968), particularly the postscript by P.B. Medawar, 'D'Arcy Thompson and "Growth and Form" '

20. E.S. Pearson, op. cit. note 1, 97.

21. See, for example, Galton's early mathematical speculations on Darwin's theory of pangenesis, in F. Galton, *Hereditary Genius* (London: Macmillan, 1869), especially the closing section, 'General Considerations'.

22. K. Pearson, 'Mathematical Contributions to the Theory of Evolution III: Regression, Heredity and Panmixia', *Philosophical Transactions of the Royal Society, Series A,* Vol. 187 (1896), 253-318; quotation at 259.

23. Ibid. Donald MacKenzie's accompanying paper, in the same issue of this journal, gives another vivid illustration of the way in which the study of heredity led Pearson into work in correlation: see D. MacKenzie, 'Statistical Theory and Social

Interests: A Case-Study', *Social Studies of Science*, Vol. 8 (1978), 35-83.

24. We shall see this point with increasing force as the paper proceeds. But, for the present, note that Pearson's 1896 paper (op. cit. note 22) is clearly written with the human condition in mind: see, particularly, 306-08.

25. For accounts of Galton's involvements in statistics, see V. Hilts, 'Statistics and Social Science', in R. Giere and R. Westfall (eds), *Foundations of Statistical Method in the 19th Century* (Bloomington, Ind.: Indiana University Press, 1973), 243-58. See also R.S. Cowan, 'Francis Galton's Statistical Ideas: the Influence of Eugenics', *Isis*, Vol. 63 (1972), 509-28.

26. For a discussion, see W. Provine, *The Origins of Theoretical Population Genetics* (Chicago: The University of Chicago Press, 1971), 179-87.

27. K. Pearson, 'Mathematical Contributions to the Theory of Evolution VIII', *Philosophical Transactions of the Royal Society, Series A*, Vol. 195 (1901), 121.

28. K. Pearson, 'Contributions to the Mathematical Theory of Evolution', *Philosophical Transactions of the Royal Society, Series A*, Vol. 185 (1894), 71-110.

29. K. Pearson, 'Contributions to the Mathematical Theory of Evolution II: Skew Variations in Homogeneous Material', *Philosophical Transactions of the Royal Society, Series A*, Vol. 186 (1895), 343-414.

30. K. Pearson, 'On the Criterion that a Given System of Deviations from the Probable in the Case of a Correlated System of Variables is Such that it can be Reasonably Supposed to have Arisen from Random Sampling', *Philosophical Magazine*, Series 5, Vol. 50 (1900), 157-75.

31. K. Pearson, *The Grammar of Science* (London: Walter Scott, 1892).

32. C. Riddle, 'Karl Pearson's Philosophy of Science' (unpublished PhD dissertation, Columbia University, New York, 1958). Available from University Microfilms. See Abstract.

33. K. Pearson, op. cit. note 31, 128.

34. See Pearson's chapter on 'Contingency and Correlation', in the third edition of his *Grammar of Science* (London: Adam and Charles Black, 1911).

35. Ibid., 170.

36. See J.B.S. Haldane, *Karl Pearson 1857-1957* (London: Biometrika Trustees, 1958), 10.

37. Taken from Morant, op. cit. note 2.

38. Pearson papers: the text of Pearson's talk 'On the Laws of Inheritance according to Galton' is in Cabinet 5, drawer 6. The Pearson papers are kept at the archive room, University College London.

39. This book is kept in the Pearson archive, University College London.

40. K. Pearson, in *Speeches at a Dinner held in University College London, in Honour of Professor Karl Pearson* (Cambridge: privately printed, 1934).

41. K. Pearson, op. cit. note 31, 34.

42. Ibid., 425.

43. Ibid., 435.

44. Ibid., 436.

45. These views are gathered from Chapter 9, 'Life', of the *Grammar of Science* (op cit. note 31), and from the various essays making up Pearson's *The Ethic of Freethought* (London: T. Fisher Unwin, 1888). A very brief statement of Pearson's position is given in the *Grammar*, 438, where, after asserting that it was 'a false view of human solidarity' that would regret 'that a capable and stalwart race of white men should replace a dark skinned tribe', he claimed again that the 'principle of the

survival of the fittest . . . is from the standpoint of science the sole account we can give of those purely human faculties of healthy activity, of sympathy, of love, and of social action which men value as their chief heritage.'

46. K. Pearson, 'Socialism and Natural Selection'. This essay was reprinted in Vol. 1 of Pearson's *Chances of Death and Other Studies in Evolution* (London: Edward Arnold, 1897). See p. 138.

47. From quite an early stage in his work Pearson floated the idea that the British nation was declining due to the growth in fertility of the lower classes and the diminution of fertility among the professional classes, whom he took to be genetically superior. The most politically effective work that was done in this area was performed, under Pearson's instruction, by David Heron, whose memoir on 'The Relation of Fertility in Man to Social Status and on the Changes in this Relation that have taken Place in the Last Fifty Years', was published in 1906 as one of the Biometric Laboratory's 'Studies in National Deterioration'.

48. See K. Pearson, *National Life from the Standpoint of Science* (London: Adam and Charles Black, 1901), 43-44.

49. K. Pearson, letter to the *Manchester Guardian* (15 February 1901).

50. Robert Parker (1857-1918) rose to a Baronetcy, and was to be a leading law lord.

51. Pearson papers: the Commonplace Book is in Cabinet 2, drawer 1.

52. A detailed account of some of the tensions felt on religious issues, most useful for comparative purposes, by some leading Victorian intellectuals is contained in F.M. Turner, *Between Science and Religion* (London and New Haven, Conn.: Yale University Press, 1974).

53. Pearson papers: Pearson to Parker, 18 September 1878.

54. See K. Pearson ('Loki'), *The New Werther* (London: C. Kegan Paul and Co., 1880). At the beginning of the book, interestingly, Pearson wrote that its contents 'truly image the mind of him who has written them, and therefore necessarily to some extent the minds of the children of his generation, who are passing through a like struggle'.

55. Ibid., 33.

56. Ibid., 34.

57. K. Pearson, 'Anarchy', *The Cambridge Review,* Vol. 2 (1881), 268-70.

58. Ibid., 270.

59. K. Pearson, 'Political Economy for the Proletariat', *The Cambridge Review,* Vol. 3 (1881), 123-26.

60. Ibid., 124.

61. Pearson papers: Parker to Pearson, 25 May 1879.

62. Ibid., Pearson to Parker, 20 June 1879.

63. Ibid., Pearson to Parker, October 1879.

64. K. Pearson, 'Kuno Fischer's New Critique of Kant', *The Cambridge Review,* Vol. 5 (1883), 109-11, esp. 111.

65. See the prefatory remarks by Pearson to W.K. Clifford, *The Common Sense of the Exact Sciences* (London: Kegan Paul Trench and Co., 1885).

66. Clifford's ideas were developed in his famous 1875 essay 'On the Scientific Basis of Morals', reproduced in W.K. Clifford, *Lectures and Essays* (London: Macmillan, 1879), Vol. 2, 74-95.

67. Pearson, *The Ethic of Freethought,* op. cit. note 45, 371. The original essay

was written in 1885.

68. Ibid., 428. The essay dates from 1887.

69. See, for example, Pearson's 'Socialism in Theory and Practice: being a lecture delivered to a working class audience', dating from February 1884 and reproduced in *The Ethic of Freethought*, op. cit. note 45. In this lecture Pearson made it quite clear that while all forms of labour were equally honourable, some forms of labour, namely that done with the brain, were far the most important.

70. For an analysis of the Fabians, see Chapter 14, 'The Fabians Reconsidered', of E.J. Hobsbawm's *Labouring Men* (London: Weidenfeld and Nicolson, 1968).

71. Pearson papers: Mrs Wilson to Pearson, 22 October 1884.

72. Pearson, *The Ethic of Freethought*, op. cit. note 45, 391.

73. Pearson papers: op. cit. note 38.

74. This possibility was interestingly discussed by Donald MacKenzie at a colloquim on Eugenics in England held at the University of Leeds, July 1977. See also the papers by MacKenzie cited in notes 15 and 23.

75. See Hobsbawm, op. cit. note 70.

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