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CHAPTER NINE

How should we do the history of statistics?

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1. STATISTICS AND THE HUMAN SCIENCES

Statistics is not a human science, but its influence on those sciences has been immense. I do not have in mind the fact that it is a tool of the sociologists, for it is used in many other fields as well – agriculture, meteorology, and sometimes even physics. I am concerned with something more fundamental than methodology. Statistics has helped determine the form of laws about society and the character of social facts. It has engendered concepts and classifications within the human sciences. Moreover the collection of statistics has created, at the least, a great bureaucratic machinery. It may think of itself as providing only information, but it is itself part of the technology of power in a modern state.

1.1 The form of laws

Different schools of sociology assign different roles to statistics. In the early 1830s August Comte wanted to give the name of 'social mechanics' or 'social physics' to his new science. But at about the same time the Belgian astronomer Adolphe Quetelet took the very same name for a new statistical science of mankind. Comte always resisted this, and coined the name 'sociology' just to get away from probabilities.[1] But Quetelet was a great propagandist. He organized the world statistical congresses and was even instrumental in starting the statistical section of the British Association in 1833. He became the grand old man of a new 'science'. Today we see that Quetelet triumphed over Comte: an enormously

A colloquium with the general title, 'Comment et pourquoi faire l'histoire des sciences humaines?' was held at Nanterre, Université de Paris X, 30 May – 1 June 1980. This is the translation of one of the numerous papers invited for discussion. It was intended to provide enough factual background to address some of the methodological questions suggested by the title of the conference. Naturally there are many important ways of doing the history of statistics that do not even overlap with the project suggested below.

influential body of modern sociological thought takes for granted that social laws will be cast in a statistical form.

1.2 *The character of statistical facts*

It was long thought to be possible that statistical laws are epiphenomena deriving from non-statistical facts at the level of individuals. By the 1890s, Durkheim had the opposite idea, urging that social laws act from above on individuals, with the same inexorable power as the law of gravity. This opinion had philosophical roots. Durkheim was well versed in the debates about emergent laws in science, laws that come into being at a certain stage of evolution. Durkheim's innovation was to found his argument on the sheer regularity and stability of quantitative social facts about statistics and crime. One name for statistics, especially in France, had been 'moral science': the science of deviancy, of criminals, court convictions, suicides, prostitution, divorce. There had been an earlier practice, also called 'moral science'. That was an a priori science of good reason, founded upon Lockeist theory of ideas. It was institutionalized as the second class of the Academy, and was abolished by Napoleon in 1803. The second class was re-established in 1834, but by then 'moral science' meant something completely different.[2] It was above all the science that studied, empirically and *en masse*, immoral behaviour. By the time that Durkheim wrote, moral science had flourished for sixty years. The great founder of modern numerical psychology, William Wundt, could say even by 1862 that statisticians had demonstrated that there are laws of love just as for all other human phenomena. In 1891, even before Durkheim's *Suicide*, Walter F. Willcox published his doctoral thesis *The Divorce Problem*[3] noting that divorce and suicide rates are correlated social indicators. During his enormously long career, Willcox (1861–1964) was to play almost as dominant a role in American statistical sociology and the census as Quetelet had once done. From the time of Quetelet to that of Willcox social facts simply became facts that are statistical in character.

1.3 *Concepts and classifications*

Many of the modern categories by which we think about people and their activities were put in place by an attempt to collect numerical data. The idea of recidivism, for example, appears when the quantitative study of crimes began in the 1820s. Thanks to medical statistics a canonical list of causes of death was established during the nineteenth century. It is

perpetuated to this day. The classification demanded by the World Health Organization is based on that devised for the (England and Wales) Registrar General's office, run by William Farr. In most parts of the world it has long been illegal to die of anything except causes on the official list – although the list of causes is regularly revised. It is illegal, for example, to die of old age.[4] As for the censuses: Article 1, §2 of the American constitution decrees that there shall be a census every ten years. At first that was only to determine the boundaries of electoral districts, and only four questions were asked. In 1870, 156 questions were asked; in 1880, the number was 13,010. More important, perhaps, were the changing categories. New kinds of people came to be counted, and the categories of the census, and of other bureaucracies such as the Factory Inspectorate in England and Wales, created (or so I would urge) the official form of the class structure of industrial societies.[5] In addition to new kinds of people, there are also statistical meta-concepts of which the most notable is 'normalcy'. It is no accident that Durkheim conceived that he was providing a general theory to distinguish normal from pathological states of society. In the same final decade of the nineteenth century, Karl Pearson, a founding father of biometrics, eugenics and Anglo-American statistical theory, called the Gaussian distribution the normal curve.

1.4 *Bureaucratic power*

It is a well-known thesis of Michel Foucault that a new kind of power emerges in the nineteenth century. In one form it is a strategic development of medicine and law. More generally he sees it as part of what he calls biopolitics. There is a certain preoccupation with bodies. The disciplines of the body that he describes in his work on the prison and on sexuality form 'an entire micro-power concerned with the body', and match up with 'comprehensive measures, statistical assessments and interventions' which are aimed at the body politic, the social body. One need not subscribe fully to this model to see that statistics of populations and of deviancy form an integral part of the industrial state. Such a politics is directly involved in capital formation through social assurance; there is what Daniel Defert calls a *technologie assurentiel* which has to do with providing a stable social order.[6] He notes that of the two chief French funds for industrial assurance, one provided the capital for home investments while the other gave us Indo-China.

It is certainly not true that most applications of the new statistical knowledge were evil. One may suspect the ideology of the great Victorian social reformers and still grant that their great fight for

sanitation, backed by statistical enquiries, was the most important single amelioration of the epoch. Without it most of you would not exist, for your great-great . . . -grandparents would never have lived to puberty. Statistical data do have a certain superficial neutrality between ideologies. No one used the facts collected by the factory inspectors more vigorously than Marx. Yet even Marx did not perceive how statistical bureaucracy would change the state. It is a glib but true generalization that proletarian revolutions have never occurred in any state whose assurantial technology was working properly. Conversely, wherever after any even partial industrialization it has failed, a revolution, either to left or to right, has occurred.

2. MY OWN CONCERNS FOR A HISTORY OF STATISTICS

I am not a historian but a philosopher with a strong after-taste of positivism. I differ from my colleagues who practise analytic philosophy chiefly over the question of history. I was trained to do 'conceptual analysis' as an undergraduate, and I still do that. However I believe that the organization of our concepts, and the philosophical difficulties that arise from them, sometimes have to do with their historical origins. When there is a radical transformation of ideas, whether by evolution or by an abrupt mutation, I think that whatever made the transformation possible leaves its mark upon subsequent reasoning. I toy with the idea that many of what we call philosophical problems are a byproduct of dim 'memories' of our conceptual past. There is a long post-Hegelian tradition according to which a philosophical problem arises because of some unnoticed feature of our thought. In English philosophy that tradition tried to fix on ahistorical facts about ordinary language. I guess instead that conceptual incoherence which creates philosophical perplexity is a historical incoherence between prior conditions that made a concept possible, and the concept made possible by those prior conditions. Many of the fundamental problems about probability, chance and determinism may be of this sort.

I do not believe that exposing the historical ground of a problem make it go away. I am concerned with explanation, not therapy. This is an unusual motivation for historical studies, and the result is hardly history at all. It is a use of the past for understanding some of the incoherence in present ideas. It cannot aim at exhausting the historical material, but rather at producing an hypothesis about the relationship between concepts in their historical sites. Such an enquiry may not be very different from George Canguilhem's early studies. Among the many respects in which he is a good model is his deliberate limiting of

questions. A philosopher is in danger of trying to survey too much. Canguilhem shows how to fix on a definite question, say the issue of the normal and the pathological in nineteenth-century medicine. One is then led into all sorts of crannies of intellectual history, but instead of rambling on one is drawn back to the core from which one began. For my purposes I choose the following family of questions.

2.1 Indeterminism

At the end of the eighteenth century the great physicist Laplace set the tone with a classic statement of determinism.[7] Even the smallest of events happen necessarily, determined by the past and by the great laws of nature. Laplace's own conception of society was set by predecessors like Turgot or Condorcet who speak of 'physical necessity' or of 'physical laws of nature' in the study of economics or society. Yet by the end of the century the American philosopher C. S. Peirce could maintain that we live in a universe of chance,[8] and Durkheim was telling us that there are irreducible statistical laws of society. I think that such events mark a fundamental transition of our categories of causality. It culminates in a metaphysical revolution. Although there had been Lucretius with his swerving atoms, physical determinism has long been the entrenched view of students of nature. What events produced what we may call the *erosion of determinism*?

2.2 The laws of chance

Laplace believed that probability is subjective, relative in part to our knowledge and in part to our ignorance of underlying causes. In 1800 there were some laws of a statistical nature, like the laws of mortality, but these were thought to be superficial, a summary of the facts. The reality of death was produced by individual causes, and that reality had nothing to do with probability. By the end of the century those very causes of death were described as probabilistic in nature. Although determinism had been eroded, it was not by creating some new place for freedom, indeed we might say that the central fact is the *taming of chance*; where in 1800 chance had been nothing real, at the end of the century it was something 'real' precisely because one had found the form of laws that were to govern chance.

2.3 The enthusiasm for figures

In 1832 Charles Babbage, often called the inventor of the computing machine, published a pamphlet urging the publication of books of

numerical constants.[9] The learned societies of Paris, Berlin and London were to take turns, every two years, in producing a list of the numbers known to mankind. Babbage had twenty kinds of numbers to be listed. They begin with familiar enough material, astronomy, atomic weights, specific heats and so forth. They quickly pass to the number of feet of oak a man can saw in an hour, the volume of air needed to keep a person alive for an hour, the productive powers of men, horses, camels and steam engines compared, the relative weights of the bones of various species, the relative frequency of occurrence of letters in various languages. Most of the numbers that were to be published were new, only a decade or so old. Between 1820 and 1840 there was an exponential increase in the number of numbers that was being published. The enthusiasm for numbers became almost universal. Nor was this avalanche limited to the human sciences. T. S. Kuhn suggests that there was a hidden transformation in the physical sciences, at exactly the same time.[10] One may develop Kuhn's insight in an obvious way. Galilean science had once said that the world was written in mathematical language, but geometry and algebra furnished the model. Only in the nineteenth century did empirical numbers assume their paramount role. It had finally become a task of the natural scientist to measure.

Despite Comte's hostility to numbers, positivism soon took for granted that positive facts were measured by numbers. Even when one reads a conservative sociologist such as Frederic Le Play who inveighs against number-crunchers of the statistical sort, one finds nothing much except numbers in his great book on European workers.[11] In the first edition of 1855 we have the budgets of the extended family ranging from semi-nomadic shepherds in the Urals to carpenters in Sheffield. Each family is recorded by about 500 numbers, how much was spent on shoes, or milk, school fees, cabbages and cauliflowers, the cost of candles. At the end of the century no one could dissent from the saying of the physicist Lord Kelvin, 'that when you can measure what you are speaking about, you know something about it; when you cannot measure it . . . your knowledge is of a meagre and unsatisfactory kind'.[12]

3. WHAT PERIOD OF TIME IS IMPORTANT?

1820 to 1900 suits me. By 1905 it was recognized that for example the fundamental law of radioactive decay is a chance process, and people were even using Monte Carlo simulation in the study of biological problems. Chance had been tamed. But, of course, any periodization is suspect. How ignore 1900–36, which ends with John von Neumann's

professed proof that the quantum mechanics then current is formally inconsistent with any underlying deterministic 'hidden variables'? Then, on the other side, how can one neglect the origins of political economy, and the work of Helvetius, Say, Smith, Bentham, Malthus or Ricardo? It was Condorcet, dead in the Terror of 1794, who got Laplace going on the probability of social matters, and who was the spiritual grandfather of Comte and Quetelet alike.

The answer is that one must choose a problem. For me, as philosopher, it is indeterminism and the taming of chance. I am interested in the growth of the possibility that real chance exists and is part of the underlying structure of the world. This possibility was confirmed only with the advent of microphysics, but it was recognized as a possibility in 1900 as it had never been in 1800. My hypothesis is that events after Laplace, and after Ricardo, make the doctrines of Peirce and Durkheim viable.

Is this to be a sharp break? Should one look for a rupture between a determinist world of 1860, say, and an indeterminist one in 1880? I do not think that kind of analysis is right here. I am not intrinsically opposed to it, and urge something of the sort, two centuries earlier, in my book *The Emergence of Probability*. But the erosion of determinism did not happen suddenly. It was rather an almost systematic interaction of a great many events, some famous, some unnoticed. Most of the events were produced by people with clear views of what they were doing, and no thought at all for indeterminism. Chapter by chapter in the course of the story that should be told, one will find a fairly steady decrease in metaphysical determinism, but no one took any notice of it. Here is a sketch of some of these events.

(a) At the start of the nineteenth century, there was the idea that in human affairs one would find economic laws; laws of mortality and so forth. These laws were thought of as unequivocal and uniform. If there were irregularities they were produced by perturbing causes (and the metaphor of perturbation was taken from the theory of planetary motions). In those early days the model of human science was Newtonian.

(b) There was the theory of probability which had been cast into a definitive form by Laplace. Its probabilities were not real facts in nature but represented our ignorance of true causes.

(c) The avalanche of numbers after 1820 revealed an astonishing regularity in statistics of crime, suicide, workers' sickness, epidemics, biological facts. Mathematicians attempted an analysis of such phenomena. The great applied mathematician S. D. Poisson invented the term 'law of large numbers' in 1835 as the name of a mathematical fact, that irregularities in mass phenomena would fade out if enough data were collected.[13] Although the term 'law of large numbers' is standard in

probability mathematics, Poisson's first usage was in connection with the analysis of jury trials.

(d) Meanwhile Quetelet, in addition to his propagandist work for statistics, and his fundamental role in preparing the Belgian census of 1840, which was to stand as an international model, had convinced the world that Gauss' bell-shaped 'law of errors' was precisely the type of law for the distribution of human, social and biological traits.

(e) There was a great debate about statistical determinism. Philosophers in our days have thought that indeterminism could provide room for free will. In 1860 the feeling was quite the opposite. If the suicide rate for an *arrondissement* of Paris is precisely predictable – and the breakdown into suicide by carbon monoxide, drowning etc., is equally foreseen – how then were the people who committed suicide free to refrain from that mortal sin? It was as if statistical laws had to act on some of the individuals in that district, and thus human freedom itself was challenged. These debates took many forms, and include the then immensely popular 1857 *History of Civilization in England* by Henry Buckle. He held that it was proved by statistics that human actions are governed by laws that are as fixed as those occurring in the world of physics.

(f) The social reformers thought that one could reorganize the 'boundary conditions' under which a population was governed by statistical laws, so that by self-consciousness one could come to affect Buckle's story of inevitable historical development. Characteristically, however, it was the facts of deviancy, poverty, and *les misérables* which would be changed by the wise intervention of lower-level bureaucrats. *Les misérables*, incidentally, is not only Hugo's title, echoing Eugène Sue; it is also a standard topic for the world statistical congresses. In 1860 William Farr introduced one of these great meetings by saying that statistics did not exclude free will, because although statistical laws determined the course of a population, we ('We', not they) could change the boundary conditions and so change the laws under which the population would evolve. The most powerful critique of such statistical utilitarianism, with specific satire on freedom of choice, is found in Dickens' *Hard Times* of 1854.

(g) After 1860 James Clerk Maxwell in Britain and Ludwig Bolzmann in Germany developed statistical mechanics, one of the great new ideas of physics, which in the setting of thermodynamics provided the first account of irreversible change within theoretical physics. But far from being avowedly indeterministic, Bolzmann thought one could understand the stability of molecules in large numbers precisely in terms of Poisson-style laws of large numbers. Maxwell however, was well aware of Quetelet's investigations of the Gaussian error curve for human populations, and of related derivations that had occurred in British publications.

(h) Darwinism played its part, but it was only after the groundswell of social Darwinism that influential readers began to give a probabilistic interpretation to Darwin's work.

(i) Darwin's cousin, Francis Galton, began to explain biological facts, and the phenomena of human heredity, by deducing them from the normal or Gaussian distribution. Thus what he called regression towards mediocrity (what we call regression towards the mean) was prompted by questions about traits of notable European families, and led to our modern conception of the correlation coefficient. When we use a statistical law not only to predict and organize phenomena but also to explain them, chance is well on the way to being tamed. Yet Galton himself may have had a curiously deterministic attitude to the normal curve: 'the law . . . which reigns with serenity and in complete self effacement amidst the wildest confusion . . . the supreme law of Unreason'.[14]

(j) The erosion of determinism occurs systematically in topic after topic. Gustav Fechner, who with Wundt is the great founder of experimental psychology, employed the normal law of error to explain why his experimental subjects misjudged, for example, relative weights, but he insisted on an absolutely deterministic law of transmission from a stimulus on the body to a sensation experienced by the mind.[15] His derivation of the so-called Weber–Fechner law is probabilistic in character, but at all the essential points of interaction between body and mind no probability could, for him, conceivably enter. That was in 1860. In 1879 Ebbinghaus would commence the study of short-term memory using probability curves. His generation could begin to regard these as embodying intrinsic probabilities rather than merely extrinsic random error. As chance was tamed, the probability in these theories acquired a completely new significance.

In short, almost no domain of human enquiry is left untouched by the events that I call the avalanche of numbers, the erosion of determinism and the taming of chance. Some which we now think of as obvious but minor were once of cardinal importance. Epidemiology is an instance. For half a century after the great cholera epidemic of 1832, Europeans were obsessed by fears of epidemic disease, but as the fears declined, so the very notion of an epidemic passed from a deterministic scourge to a probabilistic contagion, and much able, although localized, probability reasoning was connected with this. Those who prefer a large canvas can relate the development of economic theory in terms of the introduction of chance mechanisms into causal processes.

After countless stories like (a)–(j), it was not surprising that Durkheim, surveying fifty French books about suicide statistics, could think that probabilistic social laws have their own reality. It was natural for Emile Boutroux to argue for the contingency of the laws of nature.[16]

C. S. Peirce was only a concluding link in a chain of philosophical thought that had begun to teach that we live in a universe of chance.

4. PARADOXES

There are a couple of instructive paradoxes here. After the avalanche of numbers, the incessant counting of social and biological facts, and the almost insanely precise measures of physical quantities, produced too many numbers to leave the Galilean and Newtonian world intact. Everyone had once thought that the Newtonian laws were altogether exact, give or take this or that 'perturbation'. Such a claim is entirely credible in a qualitative universe where one does not in fact count or measure very much. But in a quantitative universe, exactness became impossible, 'deviation from the mean' became the 'norm'. Indeterminism was about to arrive.

I found a second paradox in Ernst Cassirer, who opened my eyes to a whole range of oddities. He says that for Laplace, determinism was only a metaphor that helped him to explain that probabilities represent our ignorance rather than any objective reality. Cassirer says the modern idea of determinism is first found in a famous speech by Emil Du Bois-Reymond in 1872.[17]

Cassirer put his finger on something important although the story is complex. The word 'determinism' entered German about 1789 for an idea somewhat different from any present notion, but it does not get used regularly in French or English until the 1860s, when it is the rage for, among other things, posing questions of the free will. This date is consonant with Cassirer's observation, especially when we find that it was not Du Bois-Reymond in 1872, but Charles Renouvier in 1859, who is the first to begin to take Laplace's classic statement in the modern way.[18] The old problem of free will had chiefly been the question of whether a person with given motives and states of mind can then choose freely, or whether choice is predetermined by mental state. But Du Bois-Reymond had, in 1847, been one of a small but influential group in Berlin that had proclaimed that the mind must be understood solely in physical terms, chemistry and electricity. As a grand old man in 1872, he asks how to find a place for either consciousness or free will in such a scheme, given the Laplacian picture of complete physical determinism. For Laplace, who might well have been Cartesian, the necessary determina ion of the movement of particles need not call in question the choices of the mind, but they did for Du Bois-Reymond. Thus Laplace was indeed a determinist, but his determinism was seen to create a whole family of new problems only at the moment when determinism itself was eroded.

This is a common pattern in the history of thought: an idea becomes sharply formulated, and even named (as 'determinism'), at exactly the moment that it is being put under pressure. A vast array of new and slightly mad debates about statistical determinism in the 1860s confirms the hunch that that was a time of pressure.[19]

5. IS THIS A HISTORY OF DISCOURSE?

Historians of science distinguish internal and external history. External history is a matter of politics, economics, the funding of institutes, the circulation of journals, and all the social circumstances that are exterior to knowledge itself. Internal history is the history of individual items of knowledge, conjectures, experiments, refutations, perhaps. We have no good account of the relationship between external and internal history. One might hope for some sort of Foucaultian archaeology, which would treat an anonymous discourse. That would be a theory of what is said, regardless of who said it. Or should we take quite the opposite tack, and study this or that initiator or agent, who quite knowingly brought about this or that event?

5.1 External history

The avalanche of numbers is at least in part the result of industrialization and the influx of people from the country to the town. Many of the thought patterns for the new counting must have been set up in the Napoleonic era. We can hardly imagine that those extraordinary armies got about without a great echelon of quartermasters keeping track of how much of what was needed to feed, arm and equip scattered units all over Europe, Egypt and the East. There was almost always a perfectly good self-conscious reason for the vast majority of new countings. For example, assurance and annuities were of no importance for the peasant or agricultural worker. But when the extended village family was destroyed by the town, new forms of security were needed for daily labourers. We can often trace quite exactly how this produced new numberings.

In Britain, for example, there arose hundreds of friendly societies to provide workers with assurance against sickness or death. Although mortality tables had long been known, there were actuarial difficulties everywhere. The poor died younger than the rich, but to what extent? No information about sickness was to be had. Between 1825 and 1827 Select Committees of the House of Commons addressed themselves to the

question.[20] What are the statistical laws of sickness? Every notable statistician in Britain testified. The chief actuary for the national debt asserted there could not be such a law. Parisian authorities were consulted; they pleaded ignorance, with regret. In fact in 1824 there was one piece of data, due to the efforts of the Highland Society (which was chiefly an effective instrument of agricultural reform).[21] Few believed it. Yet a decade later a host of workers had found out specific laws of sickness for trades, regions and so forth. William Farr could assert that every disease has its own mathematical law of development. In short, during the period of the avalanche of numbers there was a problem for the friendly societies, of how to set premiums. It was solved in a decade by people who well knew what they were doing.

Statistics is an applied science. Naturally we find plenty of fine examples of such external history in which men and women of the world have practical problems to solve, and which they address in an intelligent way. Despite that, we have to notice something of a different order. There arose a certain style of solving practical problems by the collection of data. Nobody argued for this style; they merely found themselves practising it. One can often illustrate the emergence of a new style of reasoning by mentioning its extremes. Their very madness makes one begin to doubt that the practical people were merely pursuing an obvious and unproblematic form of enquiry.

(a) There was a sheer fetishism for numbers. A. M. Guerry was a French lawyer whose statistical reflections on crime and suicide are of great interest.[22] By 1832 he had unsystematically developed what we now call the rank-ordering method of testing statistical hypotheses. But we also find him amassing 85,564 individual case reports on suicides, each report with a guess at the motives. Between 1832 and 1864 he analyzed 21,132 cases of persons accused of attempted or successful murder, and broke them down into 4,478 classes of motives. This fetishism for numbers is something more than a handy external history of people solving practical problems.

(b) Guerry devised a series of classifications of suicides that now seem to us almost crazy, yet a good many of them became part of what the police were required to put into the formal reports. When the avalanche of numbers began, classifications multiplied because this was the form of this new kind of discourse. Even though any single new classification usually had a straightforward motivation that can be reported by the external historian, the very fact of the classifications and of the counting was internal to a new practice. We still lack a methodology for describing the emergence of a new way of talking and doing.

I do not know how to provide an honest analysis of this complex of issues. One ought to be faithful to details of politics, commerce and

diseases, and yet at the same time recognize that politics, commerce and disease did not of themselves demand that everything in the social realm should be a question of counting.

5.2 Anonymous discourse

Nothing is more anonymous than the bureaucracy of the statisticians. All the same the founders of the science – Quetelet, Villermé, Farr, Lexis, Galton, Edgeworth or whomever we choose – imposed their personal character. Farr ran the Registrar General's office in London between 1839 and 1879. The official statistics of England and Wales served as a model for the world, and it was Farr, the man, who made it so. Quetelet's Belgian census quite clearly bears the imprint of the man, Quetelet. We still live in the shadows of these men. Our governments classify us, lodge us, tax us according to the systems that they began, and by law we shall die of the causes enumerated in Farr's nosology. Ought we to employ the model of Foucault's archaeology, and speak of an organization of statistical *connaissances* of the sort produced by Farr or Quetelet, and at the same time postulate a *savoir* of countings that is the ground for the possibility of particular *connaissances*?

6. POWER, PHILOSOPHY AND PHILANTHROPY

To some extent the difficulties I find are to be found in a historical approach to any of the human sciences. I shall conclude with something peculiar to my subject, although it has some relation to Foucault's medico-legal researches. His history of the penitentiary begins with Jeremy Bentham's Panopticon. The penal programmes of the Benthamites are part of a larger vision of sanitary reform and philanthropic effort by the utilitarians. Every physical change had moral intent. (Even late in the century routine advertisements for cheap water closets emphasize their benefits to the morality of the workman's family and the resulting stability of the social order.) I would like a term less English than 'utilitarian'. French hygienic reformers after Villermé are not utilitarians in the strict sense of the word, but their language and their activities are the same as the great English sanitary utilitarian, Edwin Chadwick. It is all part of a transnational industrial philosophy that marks the very beginning of statistics. One candidate for the first '*oeuvre*' of statistics was *The Statistical Survey of Scotland*, a twenty-one volume collection, 1791–9. The ministers of the Church of Scotland respond to detailed questionnaires about the state of their parishes. By the word

'statistical' Sinclair tells us that he means 'an inquiry directed at the conditions of life of a country, in order to establish the quantum of happiness of the inhabitants'. Neither Sinclair nor the Calvinist ministers of the Church of Scotland were Benthamites, but they were all part of a game that would establish a 'calculus of felicity'.

Perhaps the general name of this phenomenon could be one I have already mentioned, 'moral science'. That was a more common name for the science of immorality in France than in Germany or Britain, but it was also, for example, the name given in 1858 to the new faculty at Cambridge which would combine economics, philosophy and psychology. (By 1969 all the sciences had long formed their own departments or faculties and only philosophy was left, so the term 'moral science' was finally dropped). The fundamental principle of the original moral sciences was the Benthamite one: the greatest happiness to the greatest number. It was necessary to count men and women and to measure not so much their happiness as their unhappiness: their morality, their criminality, their prostitution, their divorces, their hygiene, their rate of conviction in the courts. With the advent of laws of statistics one would find the laws of love, or if not that, at least the regularities about deviancy. The erosion of determinism and the taming of chance by statistics does not introduce a new liberty. The argument that indeterminism creates a place for free will is a hollow mockery. The bureaucracy of statistics imposes not just by creating administrative rulings but by determining classifications within which people must think of themselves and of the actions that are open to them. The hallmark of indeterminism is that cliché, information and control. The less the determinism, the more the possibilities for constraint. The time when all this began was well expressed by our friend Guerry – the above-mentioned lawyer who personally collected 85,564 suicides: 'L'importance de la statistique, comme instrument de surveillance et de contrôle, dans les diverses branches des services publiques, ne pouvait échapper au coup d'oeil de Napoleon 1^er^.'[23]

NOTES

1. The most convenient source of references for work by Quetelet, and his relationship to Comte, is still J. Lottin, *Quetelet, statisticien et sociologue*, Louvain/Paris, 1912.
2. This distinction between the two kinds of moral science, with special emphasis on enlightenment 'moral science', is well described in Lorraine Daston's 1979 doctoral thesis at Harvard: 'The reasonable calculus: classical probability theory 1650–1840'.
3. Walter, F. Willcox, 'The divorce problem: a study in statistics'. *Studies in History and Economics and Public Law*, vol. 1, pp. 1–74, 1891.

4. I owe this observation to Anne Fagot's remarkable draft dissertation of 1978. 'L'explication causale de la mort'. An English translation is in preparation for Reidel.
5. This theme is elaborated in my 'Biopower and the avalanche of numbers', to be published in a volume of papers, edited by Mark Poster, from a conference on Foucault entitled 'Knowledge, Power, History', which took place at the University of Southern California in October 1981.
6. No theoretical exposition of this idea is yet available. D. Defert, J. Donzelot, F. Ewald, G. Maillet, C. Mevel, *Socialization du risque et pouvoir dans l'enterprise*, Ministère du Travail, 1977; Arpad Ajtony, Stephane Callens, Daniel Defert, François Ewald, Gerard Maillet, *Assurance-Prevovance-Sécurité: Formation historique des techniques de gestion sociale dans les sociétés industrielles*, Ministère du Travail et de la participation, 1979.
7. P. S. de Laplace, *A Philosophical Essay on Probabilities*, trans. Truscott and Emory, New York/Dover, 1951. This was the basis for lectures in 1795 and served as the introduction for Laplace's major work on probability, the *Théorie Analytique des Probabilités*.
8. C. S. Peirce, 'The doctrine of necessity' 1892, reprinted in, for example, Charles S. Peirce, *Selected Writings*, ed. P. Wiener, New York/Dover, 1966.
9. C. Babbage, 'On the advantage of a collection of numbers to be intitled the constants of nature and art', *Edinburgh Journal of Science*, N.S. vol. 12, 1832.
10. T. S. Kuhn, 'The function of measurement in modern physical science', in *The Essential Tension*, Chicago, 1977.
11. F. Le Play, *Les Oeuvriers européens étude sur les travaux, la vie domestique, et la condition morale des population ouvrières de l'Europe*, Paris, 1855.
12. Sir William Thomson (Lord Kelvin), 'Electrical units of measurement', in *Popular Lectures and Addresses*, London, 1889, vol. 1, p. 73.
13. S. D. Poisson, *Recherches sur la probabilité des jugements en matière criminelle et en matière civile*, Paris, 1837. The phrase 'law of large numbers' was introduced in public lectures two years earlier.
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15. G. T. Fechner, *Elemente der Psychophysik*, Berlin, 1860, 2 vols. (*Elements of Psychophysics*, vol. 1 only, trans. Adler, New York, 1966). See esp. vol. II, pp. 430–2.
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17. Ernst Cassirer, *Indeterminism and Modern Physics*, Chicago, 1961; Emil Du Bois-Reymond, *'Ueber die Grenzen des Naturerkennens'*, in Bois-Reyden, *Reden*, Leibzig, 1885.
18. Charles Renouvier, 'L'homme: la raison, la passion, la liberté, la certitude, la probabilité morale', in Renouvier, *Essais de critique générale*, Paris, 1859.
19. See my 'Nineteenth century cracks in the concept of determinism', forthcoming in the *Journal for the History of Ideas*.
20. *Report of the Select Committee to Consider the Laws Respecting Friendly Societies*, 5 July 1825.
21. *Report on Friendly or Benefit Societies, exhibiting the law of sickness to be deduced from returns by Friendly Societies in different parts of Scotland, drawn up by a committee of the Highland Society of Scotland*, Edinburgh, 1824.
22. André-Marie Guerry, *Essai sur la statistique morale de la France*, Paris, 1833; *Statistique morale de l'Angleterre comparée avec la statistique morale de la France*, Paris, 1864.
23. *Ibid.*, p. 3.