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1 **The argument** 1

Determinism was eroded during the nineteenth century and a space was cleared for autonomous laws of chance. The idea of human nature was displaced by a model of normal people with laws of dispersion. These two transformations were parallel and fed into each other. Chance made the world seem less capricious: it was legitimated because it brought order out of chaos. The greater the level of indeterminism in our conception of the world and of people, the higher the expected level of control.

These events began with an avalanche of printed numbers at the end of the Napoleonic era. Many kinds of human behaviour, especially wrongdoings such as crime and suicide, were counted. They appeared astonishingly regular from year to year. Statistical laws of society seemed to spring from official tables of deviancy. Data about averages and dispersions engendered the idea of normal people, and led to new kinds of social engineering, new ways to modify undesirable classes.

In the early years of the century, it was assumed that statistical laws were reducible to underlying deterministic events, but the apparent prevalence of such laws slowly and erratically undermined determinism. Statistical laws came to be regarded as laws in their own right, and their sway was extended to natural phenomena. A new kind of 'objective knowledge' came into being, the product of new technologies for gaining information about natural and social processes. There emerged new criteria for what counted as evidence for knowledge of this kind. The statistical laws that could thus be justified were used not only for description but also for explaining and understanding the course of events. Chance became tamed, in the sense that it became the very stuff of the fundamental processes of nature and of society.

2 **The doctrine of necessity** 11

In 1800 'chance', it was said, was a mere word, signifying nothing – or else it was a notion of the vulgar, denoting fortune or even lawlessness, and thus to be excluded from the thought of enlightened people. Every event followed necessarily, at least in

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the phenomenal world, from an antecedent set of conditions. Even students of vital medicine, who rejected universal laws within their domain, held to particular and individual trains of necessary causation, and would not countenance fundamental chance.

3 **Public amateurs, secret bureaucrats** 16
Eighteenth-century officials collected statistical data for taxation, recruitment and to determine the power of the state. Their information was privy to the government. Amateurs and academics had a flourishing trade in numerical facts, which were widely published but never systematically collected. Prussia is used as an example.

4 **Bureaux** 27
In the peace after Napoleon, the European states established offices to collect and publish statistics about all manner of life and administration. They created new institutions to gather and disseminate this information. These made possible the avalanche of printed numbers from 1820 to 1840. The Prussian example continued.

5 **The sweet despotism of reason** 35
But the numbers were not enough. Prussians did not develop the idea of statistical law. That happened in the West, above all in France and England. In pre-revolutionary France there had been a tradition of rational moral science. Later, the avalanche of numbers turned it into an empirical moral science, but retained the enlightened vision of regulation and law. The example of Condorcet, the theorist of reasoned choice, and of the bureaucrats who replaced him and engendered statistical thinking.

6 **The quantum of sickness** 47
Before 1815 statistical generalizations about people were largely restricted to births, deaths and marriages. An inquiry by British parliamentarians shows exactly how and when a new category of 'biological' law came into being, statistical laws of disease. A Select Committee of 1825.

7 **The granary of science** 55
More generally, the world was becoming numerical. This fact is nicely illustrated by Babbage's proposal in 1832 for a collection of Constants of Nature and Art. This was a statement about a new and pervasive kind of number, constants to be used in knowing and managing the world.

8 **Suicide is a kind of madness** 64
The avalanche of printed numbers was marked, especially in France, by the tabulation of numbers of deviants. In 1815 there

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was a controversy: who is more suicidal, Parisians or Londoners? It could not be settled then; a decade later it could, because new institutions had been established for collecting and publishing data.

Suicide is a recurring theme in statistics. In one instance of medical imperialism, there was an implicit syllogism: madness was to be treated by physicians, suicide was a kind of madness, hence the suicide statistics were treated like other medical statistics. As a result, theories of medical causation were appropriated to suicide. These were then applied to all statistics of deviancy.

9 **The experimental basis of the philosophy of legislation** 73
By the 1820s official tables could tell the number and type of suicide in a region. These data, and like information for crimes and *les misérables*, were held to provide a successor to Condorcet's rational moral science. The new empirical science of morality would deal with statistical laws of human misbehaviour.

10 **Facts without authenticity, without detail, without control, and without value** 81
The first attempts to use medical statistics as evidence for the efficacy of rates of cure: polemics about Broussais's new physiological medicine contrasted with the careful analysis of a new method for treating gallstone.

11 **By what majority?** 87
Condorcet and Laplace had attempted *a priori* solutions to the problem of designing the most efficient jury system. They lacked empirical data. These were provided by the new crime statistics of the French justice ministry. Poisson embedded this new information in a statistical approach to juries.

12 **The law of large numbers** 95
In 1835, in the course of his statistical jurisprudence, Poisson coined the phrase 'law of large numbers' and proved an important limiting theorem. This provided a further rationale for applying the mathematics of probability to social matters. It also seemed to explain how there could be statistical stability in social affairs.

13 **Regimental chests** 105
In 1844 Quetelet argued that the limiting case of relative frequencies in coin tossing (the binomial law, but also the law of error for astronomical measurements) provided a curve (our bell-shaped or Normal curve) that fitted empirical distributions of human attributes and behaviour. This seemed to provide the exact form of the new statistical laws about people. Notions of causality, including even the medical model, began to be

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rearranged in order to make statistical laws consistent with determinism.

14 Society prepares the crimes 115
A problem of statistical fatalism arose. If it were a law that each year so many people must kill themselves in a given region, then apparently the population is not free to refrain from suicide. The debate, which on the surface seems inane, reflects increasing awareness of the possibilities of social control, and implications for moral responsibility.

15 The astronomical conception of society 125
Statistical fatalism, especially with the example of suicide, was taken up in Germany following Buckle's celebrated *History of Civilization in England*. The ensuing debate highlights fundamental differences between atomistic and holistic conceptions of the new kind of law, statistical law. These differences reflect the contrast between western libertarian and eastern collectivist visions of society.

16 The mineralogical conception of society 133
Instead of averages one could be quantitative in a quite different way. The utopian traditionalist Le Play used the budget of a single family to represent the life-style of a class, and proposed an entirely different kind of social science. This contrasts with the way in which the director of the Prussian statistical office used household budgets. At issue was the very idea of what counts as objective knowledge.

17 The most ancient nobility 142
Backlash against statistics is illustrated by Vaudeville, Comte, Dostoyevsky and Nietzsche. Even those who wanted to find a place for caprice or recover an ancient idea of pure chance were ambivalent about chance, its laws and its uses.

18 Cassirer's thesis 150
Cassirer argued that the twentieth century idea of determinism is extraordinarily recent, emerging only around 1870. Thus quantum mechanics does not refute an old conception of causality but is in conflict only with a new one. What is true in his proposal is that a radical set of incoherencies in the idea of necessity came to the surface between 1850 and 1880. An account of the word 'determinism', its origins in the 1780s and its new usage in the 1860s.

19 The normal state 160
The word 'normal' has long served for both description and evaluation, but its use to mean usual or typical emerged only in the nineteenth century. It did so first in the context of

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physiology, here represented by Broussais, and then was transformed into part of a political agenda by Comte. Normality displaced the Enlightenment idea of human nature as a central organizing concept, but evolved two roles. One is the Quetelet-Durkheim conception of the normal as the right and the good. The other is the Galtonian notion of the normal as the mediocre, and in need of improvement. In either role, the idea of the normal presents itself as the seal of objectivity and impartiality, a neutral bridge between 'is' and 'ought'.

20 **As real as cosmic forces** 170
Durkheim's numerical sociology was formed in the conceptual matrix of medicine, statistics and suicide. The idea of the normal and the pathological was adapted from physiology to social science. In the course of debates about criminal anthropology, Durkheim decided that crime and suicide are normal. Deviations from the normal are indices of social morbidity. They are governed by social laws and forces that have a reality independent of individuals. Durkheim continued Quetelet's creation of new kinds of reality.

21 **The autonomy of statistical law** 180
Quetelet's bell-shaped curve became named, in England, the Normal law. It was taken to be true or approximately true of a vast range of phenomena and to show how regularity arises within what at first appears disorderly. Galton rethought Quetelet's account of the origin of statistical stability. The resulting advances in techniques of statistical inference illustrate how probability laws became autonomous of an underlying deterministic structure. The doctrine of necessity had not been abandoned, but was irrelevant to the power of statistics not only to predict but also to explain phenomena.

22 **A chapter from Prussian statistics** 189
Although statistics gave rise to certain regulative concepts, such as normalcy, that underlie possible kinds of administration of people, it is well to remember that statistics had less abstract applications. They were a direct and visible element in the exercise of power. Disputes about Jewish statistics during the Berlin *Antisemitismusstreit* of 1880 exemplify this.

23 **A universe of chance** 200
The logic of chance could not remain constant during all these changes. C.S. Peirce rejected the doctrine of necessity outright. He based the logic of inductive reasoning on statistical stability. He introduced artificial randomization into the design of experiments. He provided one of the two competing rationales for all statistical inference. His pragmatic conception of reality made truth a matter of what we find out in the long run. He

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believed in absolute chance, and in a universe in which laws of nature are at best approximate and evolve out of random processes. Chance was no longer the essence of lawlessness, but at the core of all laws of nature and all rational inductive inference. His radical indeterminism is less striking when seen as a corollary of the probabilizing of the world and our knowledge of it. He concluded that we live in a chance universe not because of an argument, but because probability and statistics were coming to permeate every aspect of life.

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