

consequent further agricultural disorders are a likely consequence of nuclear war. There is also another kind of plague to worry about: the plague bacillus is endemic all over the Earth. In the late twentieth century humans did not much die of plague—not because it was absent, but because resistance was high. However, the radiation produced in a nuclear war, among its many other effects, debilitates the body's immunological system, causing a deterioration of our ability to resist disease. In the longer term, there are mutations, new varieties of microbes and insects, that might cause still further problems for any human survivors of a nuclear holocaust; and perhaps after a while, when there has been enough time for the recessive mutations to recombine and be expressed, new and horrifying varieties of humans. Most of these mutations, when expressed, would be lethal. A few would not. And then there would be other agonies: the loss of loved ones; the legions of the burned, the blind and the mutilated; disease, plague, long-lived radioactive poisons in the air and water; the threat of tumors and stillbirths and malformed children; the absence of medical care; the hopeless sense of a civilization destroyed for nothing; the knowledge that we could have prevented it and did not.

L. F. Richardson was a British meteorologist interested in war. He wished to understand its causes. There are intellectual parallels between war and weather. Both are complex. Both exhibit regularities, implying that they are not implacable forces but natural systems that can be understood and controlled. To understand the global weather you must first collect a great body of meteorological data; you must discover how the weather actually behaves. Our approach must be the same, Richardson decided, if we are to understand warfare. So, for the years between 1820 and 1945, he collected data on the hundreds of wars that had then been fought on our poor planet.

Richardson's results were published posthumously in a book called *The Statistics of Deadly Quarrels*. Because he was interested in how long you had to wait for a war that would claim a specified number of victims, he defined an index, M , the magnitude of a war, a measure of the number of immediate deaths it causes. A war of magnitude $M = 3$ might be merely a skirmish, killing only a thousand people (10^3). $M = 5$ or $M = 6$ denote more serious wars, where a hundred thousand (10^5) or a million (10^6) people are killed. World Wars I and II had larger magnitudes. He found that the more people killed in a war, the less likely it was to occur, and the longer before you would witness it, just as violent storms occur less frequently than cloudbursts. From his data we can construct a graph (p. 327), which shows how long on the average during the past century and a half you would have to wait to witness a war of magnitude M .

Richardson proposed that if you continue the curve to very small values of M , all the way to $M = 0$, it roughly predicts the