



The Richardson diagram. The horizontal axis shows the magnitude of a war ($M = 5$ means 10^5 people killed; $M = 10$ means 10^{10} , i.e., every human on the planet). The vertical axis shows the time to wait until a war of magnitude M erupts. The curve is based on Richardson's data for wars between 1820 and 1945. Simple extrapolation suggests that $M = 10$ will not be reached for about a thousand years ($1820 + 1,000 = 2820$). But the proliferation of nuclear weapons has probably moved the curve into the shaded area, and the waiting time to Doomsday may be ominously short. The shape of the Richardson curve is within our control, but only if humans are willing to embrace nuclear disarmament and restructure dramatically the planetary community.

The potential enemy is assured that if the limit is transgressed, nuclear war will follow. However, the definition of the limit changes from time to time. Each side must be quite confident that the other understands the new limits. Each side is tempted to increase its military advantage, but not in so striking a way as seriously to alarm the other. Each side continually explores the limits of the other's tolerance, as in flights of nuclear bombers over the Arctic wastes; the Cuban missile crisis; the testing of anti-satellite weapons; the Vietnam and Afghanistan wars—a few entries from a long and dolorous list. The global balance of terror is a very delicate balance. It depends on things not going wrong, on mistakes not being made, on the reptilian passions not being seriously aroused.

And so we return to Richardson. In the diagram the solid line is the waiting time for a war of magnitude M —that is, the average time we would have to wait to witness a war that kills 10^M people (where M represents the number of zeroes after the one in our usual exponential arithmetic). Also shown, as a vertical bar at the right of the diagram, is the world population in recent years, which reached one billion people ($M = 9$) around 1835 and is now about 4.5 billion people ($M = 9.7$). When the Richardson curve crosses the vertical bar we have specified the waiting time to Doomsday: how many years until the population of the Earth is destroyed in some great war. With Richardson's curve and the simplest extrapolation for the future growth of the human population, the two curves do not intersect until the thirtieth century or so, and Doomsday is deferred.

But World War II was of magnitude 7.7: some fifty million military personnel and noncombatants were killed. The technol-