This is an introduction to the ideas of randomness that are central to much of modern physics and have overthrown the clock-work universe conceptions of earlier centuries. The author shows how the laws of probability and statistics were developed by such mathematicians as Fermat, Pascal, and Gauss, and how they received their first major application in physics in the kinetic theory of gases developed by Maxwell and Boltzmann. Here the use of statistics is necessary because the number of particles involved is too great for a deterministic calculation. But soon the mathematician and physicist Poincare demonstrated the unpredictability if certain systems containing only a small number of bodies, because of extreme sensitivity to initial conditions. He thus became a founder of chaos theory. Finally, with the advent of quantum theory, physics seemed to be based on an essential randomness, whose reality was debated by Bohr and Einstein till the end of their lives. Only recently, in the experiments of Alain Aspect, has a convincing demonstration been given the inescapable randomness of quantum theory is a fact of nature. Professor Ruhla guides the reader skilfully through all these developments and provides mathematical details in appendices. The book provides an accessible introduction to the modern physicists conception of the world of cause and chance.

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