

ALSO BY AMIT GOSWAMI

*The Concepts of Physics*  
*Quantum Mechanics*

With Maggie Goswami

*The Cosmic Dancers*

THE  
SELF-AWARE  
UNIVERSE

HOW CONSCIOUSNESS  
CREATES THE MATERIAL WORLD

*Amit Goswami, Ph.D.*

WITH RICHARD E. REED  
AND MAGGIE GOSWAMI

Jeremy P. Tarcher/Putnam  
a member of  
Penguin Putnam Inc.  
New York

## Chapter 6

# THE NINE LIVES OF SCHRÖDINGER'S CAT

MANY OF THE FOUNDERS of quantum physics had a hard time accepting its strange consequences. Schrödinger himself expressed his reservations about the probability-wave interpretation of quantum mechanics in the paradox now known as Schrödinger's cat.

Suppose that we put a cat in a cage with a radioactive atom and a Geiger counter. The radioactive atom will decay in accordance with probabilistic rules. If the atom decays, the Geiger counter will tick, the ticking will trigger a hammer, the hammer will break a bottle of poison, and the poison will kill the cat. Let us suppose that there is a 50 percent chance of this occurring within an hour (fig. 21).

How, then, would quantum mechanics describe the state of the cat after an hour? Of course, if we look, we will find the cat to be either alive or dead. What if we do not look? The probability that the cat is dead is 50 percent. The probability that the cat is alive is also 50 percent.

If you think classically, in the manner of the material realists, and take determinism and causal continuity as your guiding principles, then you might make a mental analogy to the situation in which someone has flipped a coin and then has hidden it under his palm. You do not know whether the outcome is heads or tails, but of course, it is one or the other. The cat is either dead or alive, with a 50 percent chance for each outcome. You just do not know which

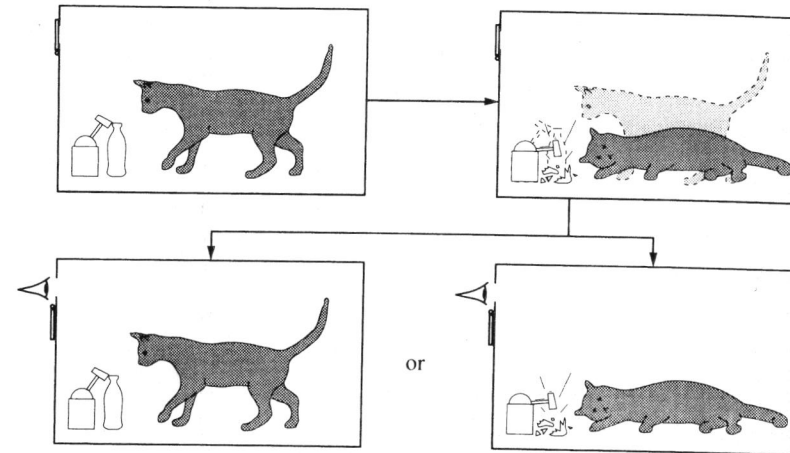


Figure 21. The paradox of Schrödinger's cat. After an hour with a radioactive atom in a cage, the cat becomes a coherent superposition of a half-dead and half-alive cat. Observation always reveals either a dead cat or a live cat. (Reprinted from A. Goswami, *Quantum Mechanics*; permission granted by Wm. C. Brown, Inc., publisher.)

outcome has, in fact, been realized. This scenario is not what the mathematics of quantum mechanics portrays. Quantum mechanics deals with probabilities very differently. It describes the state of the cat at the end of the hour as half alive and half dead. Inside the box is, quite literally, "a coherent superposition of a half-alive and a half-dead cat," to use the proper jargon. The paradox of a cat that is dead and alive at the same time is a consequence of the way in which we do our calculations in quantum mechanics. However bizarre its consequences, we must take this mathematics seriously because the same mathematics gives us the marvels of transistors and lasers.

The following parody of T. S. Eliot's *Old Possum's Book of Practical Cats* summarizes this absurd situation:

Schrödinger's cat's a mystery cat,  
he illustrates the laws;  
the complicated things he does  
have no apparent cause;  
he baffles the determinist,  
and drives him to despair  
for when they try to pin him down—  
*the quantum cat's not there!*<sup>1</sup>