“THE RED CAMARO”[22]

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On October 15, 1764, Edward Gibbon conceived the idea of writing the history of the decline and fall of the Roman Empire while he was listening to barefoot monks singing vespers in the ruins of the Roman Capitol. I wish I could say I worked in settings that glamorous. I got the idea for my best-known work while I was driving my red Camaro in Cambridge, Massachusetts, on the way to my office in the physics department at Massachusetts Institute of Technology.

I was feeling strung out. I had taken a leave of absence from my regular professorship at Berkeley a year earlier so that my wife could study at Harvard Law School. We had just gone through the trauma of moving from one rented house in Cambridge to another, and I had taken over the responsibility of getting our daughter to nursery school, playgrounds, and all that. More to the point, I was also stuck in my work as a theoretical physicist.

Like other theorists, I work with just pencil and paper, trying to make simple explanations of complicated phenomena. We leave it to the experimental physicists to decide whether our theories actually describe the real world. It was this opportunity to explain something about nature by noodling around with mathematical ideas that drew me into theoretical physics in the first place. For the previous two years, I had made progress in understanding what physicists call the strong interactions—the forces that hold particles together inside atomic nuclei. Some of my calculations had even been confirmed by experiment. But now these ideas seemed to be leading to nonsense. The new theories of the strong interactions I had been playing with that autumn implied that one of the particles of high-energy nuclear physics should have no mass at all, but this particle was known to be actually quite heavy. Making predictions that are already known to be wrong is no way to get ahead in the physics game.

Often, when you’re faced with a contradiction like this, it does no good to sit at your desk doing calculations—you just go round and round in circles. What does sometimes help is to let the problem cook on your brain’s back burner while you sit on a park bench and watch your daughter play in a sandbox.

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After this problem had been cooking in my mind for a few weeks, suddenly on my way to MIT (on October 2, 1967, as near as I can remember), I realized there was nothing wrong with the sort of theory on which I had been working. I had the right answer, but I had been working on the wrong problem. The mathematics I had been playing with had nothing to do with the strong interactions, but it gave a beautiful description of a different kind of force, known as the weak interaction. This is the force that is responsible, among other things, for the first step in the chain of nuclear reactions that produces the heat of the sun. There were inconsistencies in all previous theories of this force, but suddenly I saw how they could be solved. And I realized the massless particle in this theory that had given me so much trouble had nothing to do with the heavy particles that feel the strong interaction; it was the photon, the particle of which light is composed, that is responsible for electric and magnetic forces and that indeed has zero mass. I realized that what I had cooked up was an approach not just to understanding the weak interactions but to unifying the theories of the weak and electromagnetic forces into what has since come to be called the electroweak theory. This is just the sort of thing physicists love—to see several things that appear different as various aspects of one underlying phenomenon. Unifying the weak and electromagnetic forces might not have applications in medicine or technology, but if successful, it would be one more step in a centuries-old process of showing that nature is governed by simple, rational laws.

Somehow, I got safely to my office and started to work out the details of the theory. Where before I had been going around in circles, now everything was easy. Two weeks later, I mailed a short article on the electroweak theory to *Physical Review Letters,* a journal widely read by physicists.

The theory was proved to be consistent in 1971. Some new effects predicted by the theory were detected experimentally in 1973. By 1978, it was dear that measurements of these effects agreed precisely with the theory. And in 1979, I received the Nobel Prize in physics, along with Sheldon Glashow and Abdus Salam, who had done independent work on the electroweak theory. I have since learned that the paper I wrote in October 1967 has become the most cited article in the history of elementary-particle physics.

I kept my red Camaro until it was totaled by one too many Massachusetts winters, but it never again took me so far.