Albert Einstein : Nobel prize for Physics 1921

1905 MIRACLE YEAR

- In 1905, Einstein is 26, a patent examiner, working on physics on his own. After hours, he creates the special theory of relativity, in which he demonstrates that measurements of time and distance vary systematically as anything moves relative to anything else. Which means that Newton was wrong. Space and time are not absolute, and the relativistic universe we inhabit is not the one Newton "discovered."

That's pretty good, but one idea, however spectacular, does not make a demigod. But now add the rest of what Einstein did in 1905:

- In March, Einstein creates the quantum theory of light, the idea that light exists as tiny packets, or particles, that we now call photons. Einstein's work anchors the most shocking idea in 20th-century physics: we live in a quantum universe, one built out of tiny, discrete chunks of energy and matter.

- Next, in April and May, Einstein publishes two papers. In one he invents a new method of counting and determining the size of the atoms or molecules in a given space, and in the other he explains the phenomenon of Brownian motion. The net result is a proof that atoms actually exist—still an issue at that time—and the end to a millennia-old debate on the fundamental nature of the chemical elements.

- And then, in June, Einstein completes special relativity, which adds a twist to the story: Einstein's March paper treated light as particles, but special relativity sees light as a continuous field of waves. Einstein, age 26, sees light as wave and particle, picking the attribute he needs to confront each problem in turn. Now that's tough.

- And, of course, Einstein isn't finished. Later in 1905 comes an extension of special relativity in which Einstein proves that energy and matter are linked in the most famous relationship in physics: $E = mc^2$. (The energy content of a body is equal to the mass of the body times the speed of light squared.) At first, even Einstein does not grasp the full implications of his formula, but even then he suggests that the heat produced by radium could mark the conversion of tiny amounts of the mass of the radium salts into energy.

In sum, an amazing outburst: Einstein's 1905 still evokes awe. Historians call it the annus mirabilis, the miracle year. Einstein ranges from the smallest scale to the largest (for special relativity is embodied in all motion throughout the universe), through fundamental problems about the nature of energy, matter, motion, time, and space—all the while putting in 40 hours a week at the patent office.

FURTHER MIRACLES

And that alone would have been enough to secure Einstein's reputation. But it is what comes next that is almost more remarkable. After 1905, Einstein achieves what no one since has equaled: a 20-year run at the cutting edge of physics. For all the miracles of his miracle year, his best work is still to come:

- In 1907, he confronts the problem of gravitation.

- Even the minor works resonate. For example, in 1910, Einstein answers a basic question: "Why is the sky blue?"

- Then, in 1915, Einstein completes the general theory of relativity, the product of eight years of work on the problem of gravity. In general relativity, Einstein shows that matter and energy—all the "stuff" in the universe—actually mold the shape of space and the flow of time. What we feel as the "force" of gravity is simply the sensation of following the shortest path we can through curved, four-dimensional space-time.

- In 1917, Einstein publishes a paper that uses general relativity to model the behavior of an entire universe.