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The formula for genius

By GARY ROBBINS
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His name is shorthand for genius, something Albert Einstein hated but couldn't escape.

One century ago, the 26-year-old patent clerk shook how we think of the time, space, energy, matter and motion in a series of physics papers he carefully penned in a small, tight script over a six-month period.

Historians call it the most inspired burst of scientific logic and reasoning since Isaac Newton laid out his laws of motion and gravity more than 200 years earlier.

Einstein, a theoretician, spoke about three broad areas of physics that involved not only the physical world but the universe. Over time, these papers and later work would influence the development of everything from magnetic resonance imaging to cell phones to the nuclear energy generated at San Onofre.

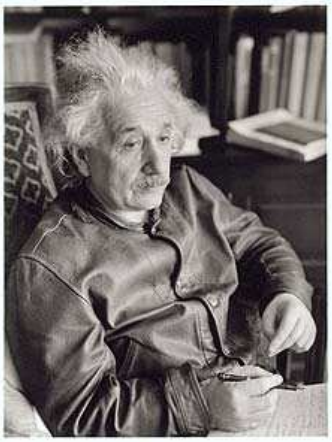
The centennial of Einstein's "miracle year" of 1905 is part of a major retrospective on his life and career that's now on display at the Skirball Cultural Center in Los Angeles. The exhibition is drawing elbow-to-elbow crowds, especially in the corner where you can look at the actual manuscript where he wrote the famous equation $E=mc^2$.

The anniversary also is being highlighted in several books, including the newly released "Einstein 1905: The Standard of Greatness" by John S. Rigden.

"Einstein was remarkable," Rigden said. "He was working in relative isolation in (Bern, Switzerland). He was not really aware of what others were doing in physics. His ideas came from his personal powers of reasoning.

"He hadn't even received his doctorate."

At the turn of the 20th century, scientists believed that light traveled in waves as it spread across the universe Einstein agreed. But he also thought that light took the form of particles when it interacted with matter, a corre insight that proved that light has a dual nature.



PLAYFUL INTELLECT: Einstein posed for this portrait, left, in 1921, the year he won a Nobel Prize.
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He outlined the idea while explaining the photoelectric effect, a quandary in physics that dealt with light and er Scientists knew that electrons flew off certain metals when the metals were exposed to light. But they didn't understand the physical process.

Einstein said an invisible photochemical reaction was behind it all. Individual particles of light – or photons – caused individual electrons to break free of their atoms and leap from the metal.

There was much skepticism. But the theory was proved experimentally, earning Einstein the Nobel Prize in 19 His musings about the tiny particles also helped establish the field of quantum mechanics, which in turn has le such things as semiconductors, computer chips and the lasers that read content on CDs.

"Pretty much everything you can get at Best Buy is based on quantum mechanics," says Jonathan Feng, a UC Irvine physicist.

Scottish botanist Robert Brown made a curious observation while peering through a microscope in 1827: Grai ofpollen suspended in water were constantly flitting around in a random fashion.

The same behavior was found to exist in other particles that were contained in liquids or in gases. Think dust moving through the air. The phenomenon was dubbed Brownian motion, and it lacked an explanation.

Einstein provided one, explaining in mathematical terms that invisible water molecules were repeatedly hitting particles, causing them to move. He also was able to calculate how fast the molecules moved and how many hitting the particles. The theory applied broadly to particles, not just pollen.

At the time, the existence of molecules was not universally accepted. Einstein's idea changed a lot of minds – not just about molecules.

"This made it easier to believe in atoms because molecules are composed of atoms," said Myron Bander, a U physicist.

This work also represented deeper proof that the physical laws governing the atomic- scale world could be mu different than those governing the larger world and the universe.

Einstein's signature paper of 1905 was a mind-blower that challenged how people thought of space, time and motion.

Most people then believed Newton's claim that space and time were fixed and unchanging. Time always ticke the same rate. And space was like a backdrop, unaffected by the objects in it.

Einstein showed that neither assumption was true. For a speeding object, time slows down and space contrac was a radical notion that was proved accurate when scientists developed experiments to test it.

The theory also stated that the speed of light was constant and that nothing could travel through space faster light. This was a lot to grasp, but Einstein went further.

He said that matter and energy are basically the same thing – in different forms. He summed up the idea in th iconic equation $E=mc^2$ (energy equals mass times the speed of light squared.)

"This equation was important for theunderstanding ofhow energy could be released from the nucleus of atoms basis of nuclear energy – and nuclear weapons," says Bill Parker, physicist and vice chancellor of research at

Sources: John S. Rigden, Washington University; Institute of Physics; UCI; Encyclopedia Brittanica

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Register staff writer Pat Brennan contributed to this report.

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