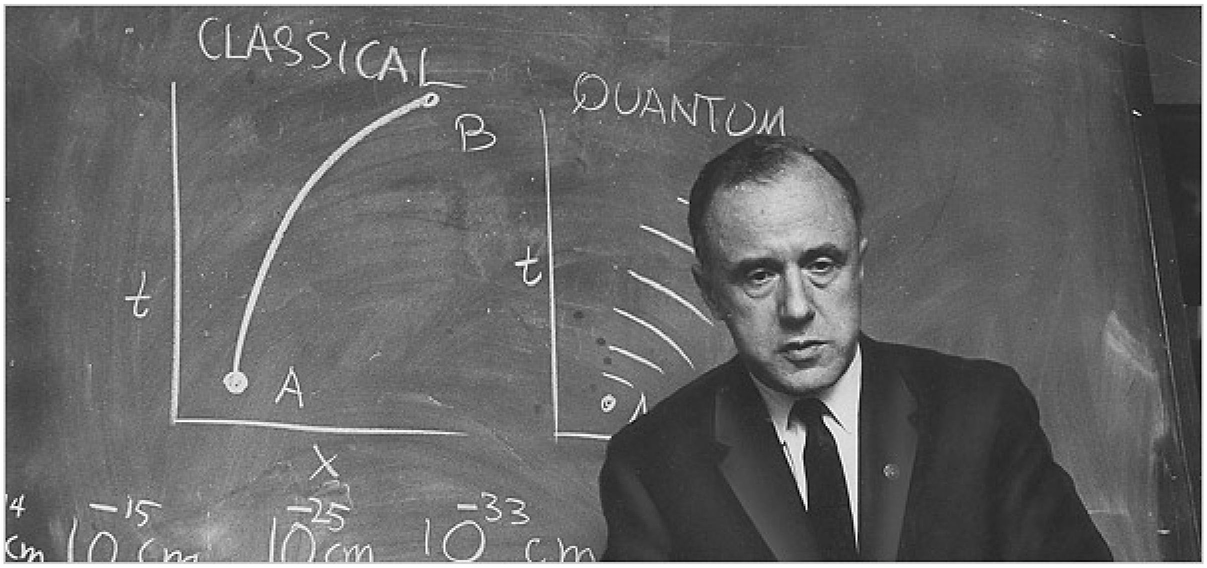
# John A. Wheeler, Physicist Who Coined the Term ‘Black Hole,’ Is Dead at 96




The New York Times

John A. Wheeler at Princeton University in 1967.

By DENNIS OVERBYE
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John A. Wheeler, a visionary physicist and teacher who helped invent the theory of nuclear fission, gave black holes their name and argued about the nature of reality with Albert Einstein and Niels Bohr, died Sunday morning at his home in Hightstown, N.J. He was 96.

The cause was pneumonia, said his daughter Alison Wheeler Lahnston.

Dr. Wheeler was a young, impressionable professor in 1939 when Bohr, the Danish physicist and his mentor, arrived in the United States aboard a ship from Denmark and confided to him that German scientists had succeeded in splitting uranium atoms. Within a few weeks, he and Bohr had sketched out a theory of how nuclear fission worked. Bohr had intended to spend the time arguing with Einstein about quantum theory, but “he spent more time talking to me than to Einstein,” Dr. Wheeler later recalled.

As a professor at Princeton and then at the University of Texas in Austin, Dr. Wheeler set the agenda for generations of theoretical physicists, using metaphor as effectively as calculus to capture the imaginations of his students and colleagues and to pose questions that would send them, minds blazing, to the barricades to confront nature.

Max Tegmark, a cosmologist at the Massachusetts Institute of Technology, said of Dr. Wheeler, “For me, he was the last Titan, the only physics superhero still standing.”

Under his leadership, Princeton became the leading American center of research into Einsteinian gravity, known as the general theory of relativity — a field that had been moribund because of its remoteness from laboratory experiment.

“He rejuvenated general relativity; he made it an experimental subject and took it away from the mathematicians,” said Freeman Dyson, a theorist at the Institute for Advanced Study across town in Princeton.

Among Dr. Wheeler’s students was Richard Feynman of the California Institute of Technology, who parlayed a crazy-sounding suggestion by Dr. Wheeler into work that led to a Nobel Prize. Another was Hugh Everett, whose Ph.D. thesis under Dr. Wheeler on quantum mechanics envisioned parallel alternate universes endlessly branching and splitting apart — a notion that Dr. Wheeler called “Many Worlds” and which has become a favorite of many cosmologists as well as science fiction writers.

Recalling his student days, Dr. Feynman once said, “Some people think Wheeler’s gotten crazy in his later years, but he’s always been crazy.”

John Archibald Wheeler — he was Johnny Wheeler to friends and fellow scientists — was born on July 9, 1911, in Jacksonville, Fla. The oldest child in a family of librarians, he earned his Ph.D. in physics from Johns Hopkins University at 21. A year later, after becoming engaged to an old acquaintance, Janette Hegner, after only three dates, he sailed to Copenhagen to work with Bohr, the godfather of the quantum revolution, which had shaken modern science with paradoxical statements about the nature of reality.

“You can talk about people like Buddha, Jesus, Moses, Confucius, but the thing that convinced me that such people existed were the conversations with Bohr,” Dr. Wheeler said.

Their relationship was renewed when Bohr arrived in 1939 with the ominous news of nuclear fission. In the model he and Dr. Wheeler developed to explain it, the atomic nucleus, containing protons and neutrons, is like a drop of liquid. When a neutron emitted from another disintegrating nucleus hits it, this “liquid drop” starts vibrating and elongates into a peanut shape that eventually snaps in two.

Two years later, Dr. Wheeler was swept up in the Manhattan Project to build an atomic bomb. To his lasting regret, the bomb was not ready in time to change the course of the war in Europe and possibly save his brother Joe, who died in combat in Italy in 1944.

Dr. Wheeler continued to do government work after the war, interrupting his research to help develop the hydrogen bomb, promote the building of fallout shelters and support the Vietnam War and missile defense, even as his views ran counter to those of his more liberal colleagues.

Dr. Wheeler was once officially reprimanded by President Dwight D. Eisenhower for losing a classified document on a train, but he also received the Atomic Energy Commission's Enrico Fermi Award from President Lyndon B. Johnson in 1968.

When Dr. Wheeler received permission in 1952 to teach a course on Einsteinian gravity, it was not considered an acceptable field to study. But in promoting general relativity, he helped transform the subject in the 1960s, at a time when Dennis Sciama, at Cambridge University in England, and Yakov Borisovich Zeldovich, at Moscow State University, founded groups that spawned a new generation of gravitational theorists and cosmologists.

One particular aspect of Einstein's theory got Dr. Wheeler's attention. In 1939, J. Robert Oppenheimer, who would later be a leader in the Manhattan Project, and a student, Hartland Snyder, suggested that Einstein's equations had made an apocalyptic prediction. A dead star of sufficient mass could collapse into a heap so dense that light could not even escape from it. The star would collapse forever while spacetime wrapped around it like a dark cloak. At the center, space would be infinitely curved and matter infinitely dense, an apparent absurdity known as a singularity.

Dr. Wheeler at first resisted this conclusion, leading to a confrontation with Dr. Oppenheimer at a conference in Belgium in 1958, in which Dr. Wheeler said that the collapse theory "does not give an acceptable answer" to the fate of matter in such a star. "He was trying to fight against the idea that the laws of physics could lead to a singularity," Dr. Charles Misner, a professor at the University of Maryland and a former student, said. In short, how could physics lead to a violation itself — to no physics?

Dr. Wheeler and others were finally brought around when David Finkelstein, now an emeritus professor at Georgia Tech, developed mathematical techniques that could treat both the inside and the outside of the collapsing star.

At a conference in New York in 1967, Dr. Wheeler, seizing on a suggestion shouted from the audience, hit on the name "black hole" to dramatize this dire possibility for a star and for physics.

The black hole "teaches us that space can be crumpled like a piece of paper into an infinitesimal dot, that time can be extinguished like a blown-out flame, and that the laws of physics that we regard as 'sacred,' as immutable, are anything but," he wrote in his 1999 autobiography, "Geons, Black Holes & Quantum Foam: A Life in Physics." (Its co-author is Kenneth Ford, a former student and a retired director of the American Institute of Physics.)

In 1973, Dr. Wheeler and two former students, Dr. Misner and Kip Thorne, of the California Institute of Technology, published "Gravitation," a 1,279-page book whose witty style and accessibility — it is chockablock with sidebars and personality sketches of physicists — belies its heft and weighty subject. It has never been out of print.

In the summers, Dr. Wheeler would retire with his extended family to a compound on High Island, Me., to indulge his taste for fireworks by shooting beer cans out of an old cannon.

He and Janette were married in 1935. She died in October 2007 at 99. Dr. Wheeler is survived by their three children, Ms. Lahnston and Letitia Wheeler Ufford, both of Princeton; James English Wheeler of Ardmore, Pa.; 8 grandchildren, 16 great-grandchildren, 6 step-grandchildren and 11 step-great-grandchildren.

In 1976, faced with mandatory retirement at Princeton, Dr. Wheeler moved to the University of Texas.

At the same time, he returned to the questions that had animated Einstein and Bohr, about the nature of reality as revealed by the strange laws of quantum mechanics. The cornerstone of that revolution was the uncertainty principle, propounded by Werner Heisenberg in 1927, which seemed to put fundamental limits on what could be known about nature, declaring, for example, that it was impossible, even in theory, to know both the velocity and the position of a subatomic particle. Knowing one destroyed the ability to measure the other. As a result, until observed, subatomic particles and events existed in a sort of cloud of possibility that Dr. Wheeler sometimes referred to as "a smoky dragon."

This kind of thinking frustrated Einstein, who once asked Dr. Wheeler if the Moon was still there when nobody looked at it.

But Dr. Wheeler wondered if this quantum uncertainty somehow applied to the universe and its whole history, whether it was the key to understanding why anything exists at all.

"We are no longer satisfied with insights only into particles, or fields of force, or geometry, or even space and time," Dr. Wheeler wrote in 1981. "Today we demand of physics some understanding of existence itself."

At a 90th birthday celebration in 2003, Dr. Dyson said that Dr. Wheeler was part prosaic calculator, a "master craftsman," who decoded nuclear fission, and part poet. "The poetic Wheeler is a prophet," he said, "standing like Moses on the top of Mount Pisgah, looking out over the promised land that his people will one day inherit." Wojciech Zurek, a quantum theorist at Los Alamos National Laboratory, said that Dr. Wheeler's most durable influence might be the students he had "brought up." He wrote in an e-mail message, "I know I was transformed as a scientist by him — not just by listening to him in the classroom, or by his physics idea: I think even more important was his confidence in me."

Dr. Wheeler described his own view of his role to an interviewer 25 years ago.

"If there's one thing in physics I feel more responsible for than any other, it's this perception of how everything fits together," he said. "I like to think of myself as having a sense of judgment. I’m willing to go anywhere, talk to anybody, ask any question that will make headway.

“I confess to being an optimist about things, especially about someday being able to understand how things are put together. So many young people are forced to specialize in one line or another that a young person can’t afford to try and cover this waterfront — only an old fogy who can afford to make a fool of himself.

“If I don’t, who will?”

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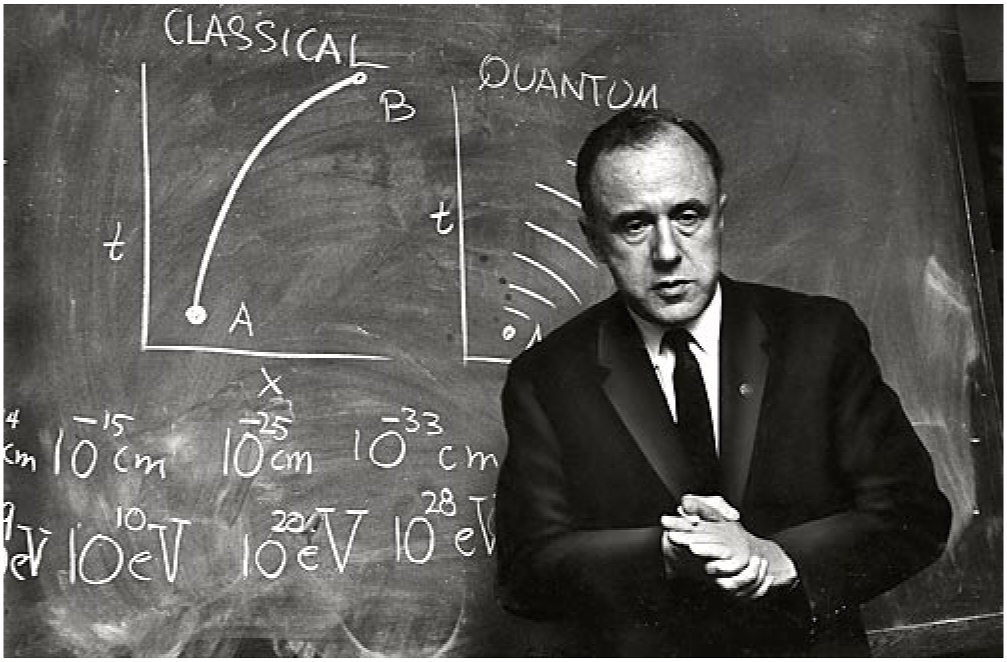
# John A. Wheeler, 96; physicist coined the term 'black hole'




The New York Times

John A. Wheeler's scientific career spanned 80 years and included consulting with Robert Oppenheimer on the bomb and debating quantum physics with Albert Einstein.

By John Johnson Jr., Los Angeles Times Staff Writer

April 15, 2008

John A. Wheeler, the fertile-minded physicist who popularized mind-stretching ideas about black holes, wormholes and quantum foam and also confounded admirers by helping to conceive some of the most potent weapons of mass destruction, has died. He was 96.

Wheeler died Sunday morning of pneumonia at his home in Hightstown, N.J., according to his daughter, Alison Wheeler Lahnston. He had been in poor health for the last week.

Photo Gallery

John A. Wheeler | 1911-2008

In the world of science, the 20th century was seen as the century of physics, and Wheeler was its most imaginative adman. He was also science's Zelig, seeming to be present at every important event or discovery. In a career that spanned eight decades, Wheeler consulted with Niels Bohr and Robert Oppenheimer to build the atomic bomb, helped Edward Teller with the hydrogen bomb, argued quantum mechanics with Albert Einstein and then, in middle age, turned his nimble mind to some of the most challenging problems of cosmology.

Are there multiple universes? If there are, how can we move from one to the other? Would anything exist if mankind -- the observer/participator -- wasn't around to see it?

He fearlessly explored such ideas as the possibility of traveling across deep space in fanciful constructs he named wormholes, by his example giving lesser-known physicists the courage to pursue cosmological questions without fear of ridicule.

Along the way, he nurtured the careers of a new generation of physicists, from Nobel laureate Richard Feynman to Caltech's Kip Thorne.

To the end, Wheeler asked big questions, adopting a personal mantra: "How come the quantum? How come existence?"

"Some people think Wheeler's gotten crazy in his later years," Feynman said. "But he's always been crazy."

Born July 9, 1911, in Jacksonville, Fla., John Archibald Wheeler was the eldest of four children of peripatetic librarians. At age 4, he asked his mother about the universe. "Where does it end? How far out can you go?"

Her answer -- if any answer is possible -- didn't satisfy. "This created a terrible worry in my mind," he said in a 2003 interview. While still a child, Wheeler turned to J. Arthur Thompson's "Outline of Science," which he read in the snow while fetching maple syrup near his Vermont home.

Curious to the point of ignoring the need for self-preservation, he set off bottle rockets indoors and once touched an 11,000-volt power line to see what it felt like.

After several moves across the country with his family, Wheeler attended Johns Hopkins University, earning a doctorate with a dissertation on the dispersion and absorption of helium. In 1933, he embarked upon one of the most profound journeys of his life, traveling to Copenhagen to study with Bohr, the physics giant who won a Nobel Prize for his explorations into the structure of the atom.

"You can talk about people like Buddha, Jesus, Moses, Confucius," Wheeler told the New York Times in 2002 in discussing Bohr's inspirational genius. "But the thing that convinced me that such people existed were the conversations with Bohr."

Wheeler was teaching at Princeton University in 1939 when Bohr arrived in New York for a visit, carrying the alarming news that scientists in Nazi Germany had only weeks earlier found a way to split the uranium atom. "We at once plunged into the understanding of this act of fission," Wheeler said.

Two months later, he and Bohr were sitting in Einstein's office at Princeton when the Danish physicist declared that it was possible to make an atomic bomb, though "it would take the entire efforts of a nation to do it." After the attack on Pearl Harbor in 1941 thrust the United States into World War II, these men were key thinkers in the Manhattan Project, commissioned by President Franklin Delano Roosevelt to build an atomic weapon before the Germans.

Though Oppenheimer and other Manhattan Project scientists worked at Los Alamos National Laboratory in New Mexico, Wheeler consulted with DuPont engineers to build reactors in Hanford, Wash., that would supply the plutonium for the bombs dropped on Japan in 1945. It was Wheeler's idea to house the reactors in domes, which have become the symbol of nuclear power plants.

Though the bomb makers would fall under criticism from succeeding generations of scientists, Wheeler was sorry that work on the bomb hadn't started earlier, feeling that it would have saved millions of lives, including that of his younger brother Joe. To the end of his life, Wheeler remained haunted by a note he received in 1944 from his brother, who was fighting in Europe. It contained two words: "Hurry up."

Joe Wheeler died fighting in Italy.

More criticism would come when he joined Teller, the supposed model for the ultrahawkish, deranged Dr. Strangelove of comic fiction, in building the hydrogen bomb in the early 1950s. But Wheeler, ever the dutiful patriot nurtured on Cold War ideology, had trouble understanding the other side.

"In my mind, I was answering a call to national service," Wheeler wrote in his 1998 autobiography, "Geons, Black Holes and Quantum Foam: A Life in Physics."

He recalled Bohr once remarking, "Do you imagine for one moment that Europe would now be free of Soviet control if it were not for the [threat of the] atomic bomb?"

After defense work, Wheeler turned his attention to the cosmological questions that increasingly occupied physicists in the second half of the 20th century, frequently displaying an adman's touch for coining the word or phrase that would capture the public imagination.

In a 1967 meeting of the Institute of Space Studies, he referred to the idea of a "gravitationally completely collapsed object." Frustrated with the awkward phrase, he adopted the term "black hole" to describe an exploded star collapsing into an object so dense that nothing can escape its gravity, including light.

He also came up with the term wormholes as well as quantum foam, the world of the very small in which ordinary laws of physics break down.

He struggled, as Einstein had, to reconcile relativity-based ideas of gravity with quantum mechanics, ultimately arriving at the term geon, a ball of light held together by its own gravity. Geons have yet to be found in nature.

To Wheeler, quantum mechanics was a "great smoky dragon," particularly with respect to the bizarre behavior of the electron, which defied classification as a wave or a particle. It could be anywhere, everywhere or nowhere, depending on the observer.

This led him to the conclusion that reality, as we know it, comes into existence only because we are here to see it and bring it to life.

"How come the universe? How come us? How come anything?" he wrote in his journal, according to a visiting reporter who saw it in 2002.

Happily, he said, the answer lies in the observers. "That's us," he said.

Even at an age when most physicists' best ideas are decades behind them, Wheeler remained active and relevant. Isaac Asimov's biographical encyclopedia of science, written in 1982, said Wheeler has "remained in the forefront of theoretical thinking," matched only by theoretical physicist Stephen Hawking.

In his 90s, Wheeler took up residence in a retirement home in Hightstown, N.J., but continued to take the bus twice a week to Princeton, where he dictated his thoughts to a secretary. Though to outward appearances his mind remained sharp, he felt, especially after a heart attack in 2001, that his thinking had been disrupted. Instead of ideas, he said, he had "ideas for ideas."

Privately, he was courteous but reserved. "I was never much for small talk," he said.

His wife, the former Janette Hegner, died in October 2007 at 99. They had two daughters, Alison Wheeler Lahnston and Letitia Wheeler Ufford of Princeton, N.J., and a son, James English Wheeler of Ardmore, Pa., who survive him along with eight grandchildren, 16 great-grandchildren, six step-grandchildren and 11 step-great grandchildren.

His hobbies included swimming and working in the woods. But the big questions were never far from his mind, even in times of leisure. "I have to admit that I never stop thinking about physics," he said.

Once asked if he had a central vision, he replied: "It's the picture that the whole of this existence will someday have its single, central principle spring to life, that will be so natural we will say to ourselves: 'How can it have been otherwise? And how could we have been so stupid all these years not to have seen it?' "

Wheeler was the author of 13 books and hundreds of articles in scholarly publications. Among his awards were the Einstein Prize in 1965; the Enrico Fermi Award from the Atomic Energy Commission in 1968, which was presented to him by President Johnson; the National Medal of Science in 1971; and the Niels Bohr International Gold Medal in 1982.

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