

2004 Nobel Prize in physics

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Three Americans Win Nobel Prize in Physics
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STOCKHOLM, Sweden — Americans David J. Gross, H. David Politzer and Frank Wilczek won the 2004 Nobel Prize in physics on Tuesday for their explanation of the force that binds particles inside the atomic nucleus.

Their work has helped science get closer to "a theory for everything," the Royal Swedish Academy of Sciences (search) said in awarding the physics prize.

It was a 1973 breakthrough by the trio — researchers at the University of California, Santa Barbara, the California Institute of Technology and the Massachusetts Institute of Technology — that explained how the so-called "strong force" works.

The force keeps quarks, the building blocks of protons and neutrons, tightly bound to one another even though the positive electromagnetic charge of protons in the nucleus would break them apart.

"I'm shocked, very surprised and honored," Gross said of winning the prize.

Reached by Swedish radio at his home in Massachusetts, Wilczek, 53, said he was surprised and gratified.

"Of course it is something I've been dreaming about for quite a while now," he said.

He said he would spend the day "sort of floating six feet above the ground."

The three physicists came by their discovery through a brilliant and non-intuitive insight. They showed that unlike forces such as electromagnetism and gravity, which grow more powerful as two particles get closer to one another, the strong force actually gets weaker as two quarks converge.

It is as if the particles were connected by a rubber band that pulls them together more tightly as it stretches.

Wilczek and Politzer, 55, were still graduate students at the time of the discovery; Gross, now 63, was a young professor.

Their achievement cemented the theory of quantum chromodynamics, which describes the interactions of quarks and other subatomic particles inside the atomic nucleus.

It also filled a critical remaining gap in what physicists refer to as the Standard Model, the theory that governs physics at the microscopic scale. It accounts for the behavior of three out of nature's four fundamental forces — electromagnetism, the strong force and the weak force, which governs radioactive decay.

The ultimate goal of physics would be to unify the Standard Model with Einstein's theory of general relativity, which describes how gravity works and predicts the existence of black holes, wormholes and other far-out phenomena.

The work of Wilczek, Gross and Politzer brought science one step closer to that "grand dream," the Swedish academy noted.

Alfred Nobel, the wealthy Swedish industrialist and inventor of dynamite who endowed the prizes, left only vague guidelines for the selection committee.

In his will, he said the prize should be given to those who "shall have conferred the greatest benefit on mankind" and "shall have made the most important discovery or invention within the field of physics."

The academy, which also chooses the chemistry and economics winners, invited nominations from previous recipients and experts in the fields before cutting down its choices.

Last year physicists Vitaly L. Ginzburg of Russia and Americans A. Abrikosov and Anthony J. Leggett were honored for their work on superconductivity and superfluidity, the motion of a fluid without internal friction.

This year's award announcements began Monday with the Nobel Prize in medicine going to Americans Richard Axel and Linda B. Buck.

Axel, 58, and Buck 57, were selected by a committee at Stockholm's Karolinska Institutet for their work on the sense of smell. They clarified the intricate biological pathway from the nose to the brain that lets people sense smells.

The winner of the Nobel Prize in chemistry will be named Wednesday and the literature prize will be announced Thursday. The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel will be announced Oct. 11.

The winner of the coveted peace prize — the only one not awarded in Sweden — will be announced Friday in Oslo, Norway.

The prizes, which include a \$1.3 million check, a gold medal and a diploma, are presented on Dec. 10, the anniversary of Nobel's death in 1896.

