The Latest: Research changed the course of particle physics

October 6 2015

A screen shows the winners as members of the Nobel Assembly announce the winner of the 2015 Nobel Prize in physics, in Stockholm, Tuesday Oct. 6, 2015. Takaaki Kajita of Japan and Arthur McDonald of Canada won the Nobel Prize in physics for the discovery of neutrino oscillations. The Royal Swedish Academy of Sciences said the two researchers had made key contributions to experiments showing that neutrinos change identities. (Fredrik Sandberg/TT via AP)

Latest developments in the announcements of the Nobel Prizes (all times

local):

Read update story: Kajita, McDonald win Nobel physics prize for neutrino work

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5 p.m.

Discoveries by the Nobel physics laureates have bolstered the notion that neutrinos may have protected us all from complete annihilation by tilting the balance between matter and antimatter, said Hitoshi Murayama, director of the Kavli Institute for the Physcis and Mathematics of the Universe at the University of Tokyo.

He said Takaaki Kajita and his co-awardee Arthur McDonald discovered that neutrinos have tiny amount of mass, making that theory "very plausible."

"Clearly, Kajita's work changed the direction of research in particle physics worldwide," he said.

Physics has become something of a specialty for Japan. Of the country's 24 Nobel laureates, 11 have won the physics prize.

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4:25 p.m.

Guido Drexlin, a neutrino expert at the Karlsruhe Institute of Technology in Germany, recalls the day Nobel laureate Takaaki Kajita presented his findings to the science world, in 1998.

"There were about 500 scientists, young and old, and after the

presentation the whole room was on its feet," Drexlin told the AP. "It was like a rock concert. I've never experienced anything before or after, that results were celebrated so enthusiastically at a science conference."

Drexlin said Kajita's discovery revolutionized the field of neutrino science, including his own work.

While Kajita and fellow laureate Arthur McDonald discovered that different types of neutrino have a different mass, they have only been able to determine the difference relative to each type.

"Neutrinos are a million times lighter than an electron, which is a charged version of a neutrino," said Drexlin. Determining the absolute weight of neutrinos is something his team at the Karlsruhe Tritium Neutrino experiment, or KATRIN, hopes to start working on next year.

Drexlin said while most particles get their mass from the Higgs boson—whose discovery led to a Nobel prize two years ago—some scientists believe the neutrino gets its mass from another, as yet undiscovered particle.

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3:10 p.m.

Joseph Lykken, deputy director of the Fermi National Accelerator Laboratory in Batavia, Illinois, says the discoveries for which the Nobel Prize in physics was awarded this year "put the neutrinos front and center as one of the big mysteries of physics."

The work "really inspired a whole global community of scientists to drop what they were doing and try to understand the neutrino," he said. "That really launched neutrinos as a major activity in particle physics."

The prizes this year were awarded to Japanese researcher Takaaki Kajita and Canadian Arthur McDonald.

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2:40 p.m.

The neutrino research honored by this year's Nobel Prize for physics "changes our understanding of the fundamentals of particle physics, and particles make up everything in the universe," said Robert G.W. Brown, chief executive officer of the American Institute of Physics.

"It changes our understanding of the cosmos itself."

Brown said that by showing neutrinos have mass, the work helps scientists understand how much mass exists in the universe.

Brown also said the work is another success for the theory known as quantum mechanics, which deals with fundamental particles and their interactions, because that's the only way to explain how neutrinos can change from one type to another.

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2:30 p.m.

A phone call from Sweden left Japanese physics laureate Takaaki Kajita overwhelmed.

"My cell phone started vibrating as the phone call came in, but it was a strange phone number that I've never seen. After I heard the news, my legs were trembling for a while," he told a news conference in Tokyo.

He was still nervous hours later at the news conference. After saying he was extremely honored, he added apologetically: "My mind has gone completely blank, I don't know what to say."

Kajita did note that his work requires a team of more than 100 researchers working at the huge Super-Kamiokande detector. "Even though my name is mentioned as a recipient, I share the prize with all members of the research" team, he said.

Kajita also thanked for the town of Kamioka, in Japan's northern prefecture of Toyama, for hosting the Super-Kamiokande and its predecessor.

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1:30 p.m.

Antonio Ereditato, a neutrino expert and director of the Albert Einstein Center for Fundamental Physics at the University of Bern, Switzerland, called the award "a great day for our field."

Ereditato said the idea that neutrinos could transform from one type into another was first put forward in the late 1950s, but scientists' understanding of the process was rather vague until Kajita's announced his discovery in 1998.

"This was a big shock because he proved in a statistically significant manner, what we call evidence, that neutrinos oscillate," said Ereditato. "Then Art McDonald explored another channel using solar neutrinos. ... The two deserved this award."

"The discovery of neutrino oscillation was first evidence of physics beyond our knowledge at the time, beyond the standard model. It was

something really unexpected that opened the way to new physics," Ereditato told The Associated Press.

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1:25 p.m.

Takaaki Kajita is the second Nobel physics prize winner from the same research team, led by his teacher Masatoshi Koshiba who won the prize 2002

Reona Esaki, who was awarded Nobel physics in 1973, praised Kajita's achievement, saying it was a "well-deserved" honor.

"Mr. Kajita achieved a long-cherished dream of all human beings to understand the basics of the universe," he said.

Esaki said Kajita's achievement comes from the research equipment developed by his teacher Koshiba for the observation of neutrino.

"The progress in science is made only step by step. Mr. Kajita made a major contribution to one of those steps," Esaki told a live interview with Japan's national broadcaster NHK.

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1:15 p.m.

Professor Barbro Asman says the discovery made by the 2015 Nobel Prize physics laureates will fundamentally change the scorebooks in physics and could help explain human existence and the origin of the universe.

Asman, a member of the Royal Swedish Academy of Sciences,

compared Takaaki Kajita's and Arthur B. McDonald's discovery that the neutrino particles can change identities to the groundbreaking discovery of the Higgs particle.

She said, "This is a really big discovery" that "opens up a new window in physics."

Asman said the discovery could help explain why there is more matter than antimatter in the universe, a riddle that has eluded scientists for years.

"When matter is created, it's created with equal amount of matter and antimatter," she says. "So the problem we have then is why are we here containing only matter?

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12:30 p.m.

Arthur McDonald has described the publicity surrounding winning the Nobel Prize for physics as "a very daunting experience, needless to say."

Speaking by phone to the Nobel ceremony in Stockholm, he said his eureka moment was when it became clear that his experiment had proven witih great accuracy that neutrinos change from one type to another as they travel from the sun to Earth.

Asked about impact of the discovery, McDonald said that if you don't know whether neutrinos have mass, it is diffcult to understand how to incorporate them into basic theories of fundamental physics. So finding that they have mass helps in that regard.

Asked what other questions about neutrinos remain to be answered,

McDonald said that scientists would like to know what the actual mass of the neutrino is. And experiments are looking at whether there are other types of neutrinos beyond the three clearly observed.

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11:55 a.m.

Takaaki Kajita and Arthur McDonald have won the 2015 Nobel Prize in physics.

The Royal Swedish Academy of Sciences cited the researchers "for the discovery of neutrino oscillations, which shows that neutrinos have mass."

Neutrinos are particles that whizz through the universe at nearly the speed of light.

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9:55 a.m.

The winner or winners of this year's Nobel Prize in physics are set to be announced at 0945 GMT by a committee at the Royal Swedish Academy of Sciences.

Since the Nobel Prizes were first handed out in 1901, 198 laureates have received the physics award. Only two were women.

American scientist John Bardeen is the only person to have won the physics award twice, in 1956 and 1972.

On Monday the 2015 Nobel Prize in medicine went to scientists from Japan, the U.S. and China who discovered drugs that are now used to fight malaria and other tropical diseases.

The prize announcements continue with chemistry on Wednesday, literature on Thursday, the Nobel Peace Prize on Friday and the economics award next Monday.

More information: www.nobelprize.org/