

The Nobel Prize and the Scientific Commons

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By Oct 10, all of this year's Nobel Prizes have been announced. A total of six scientists from four countries have received the world's most prestigious scientific honors in physics, chemistry, physiology or medicine.

There is no doubt that the laureates have devoted extraordinary effort to their research, and the breakthroughs for which they have been recognized are a fitting reward for their dedications.

Belgian-born American scientist Francis Halzen, for example, first proposed in 1988 the idea of using Antarctic ice to detect neutrinos. He argued that the Antarctic ice sheet, with little external interference and stable geological conditions, offered an ideal environment for detecting the faint flashes of light produced when neutrinos interact with matter.

With Halzen playing a driving role, the IceCube Neutrino Observatory was completed in 2011, with optical sensors deployed throughout roughly one cubic kilometer of Antarctic ice (Figure 1). Researchers detected the first high-energy neutrinos and later established that some had originated beyond the solar system. More importantly, they found a flux of high-energy neutrinos far greater than expected, with an energy spectrum inconsistent with gamma-ray bursts. The findings suggested the existence of previously unidentified "hidden accelerators" in the universe, and perhaps offered another opportunity to deepen humanity's understanding of the cosmos.

German scientists Peter Hegemann and Georg Nagel, meanwhile, began by studying a single-celled green alga capable of swimming toward light. The organism contains a light-sensitive protein known as channelrhodopsin. When exposed to blue light, the protein opens ion channels in the cell membrane, allowing charged ions to enter and generate an electrical signal. Crucially, they found that introducing the protein into other cells could make those cells respond to light as well.

American scientist Karl Deisseroth subsequently introduced the relevant genes into neurons and demonstrated in 2005 that blue light could be used to precisely trigger electrical activity in nerve cells. He later applied the method to the brains of living mice. Today, the technique, known as optogenetics, has become an important tool in neuroscience. It is being used to investigate neurological disorders, including Parkinson's disease and epilepsy, and may even offer ways of restoring some degree of vision to people with visual impairment.

Yet these achievements should not be viewed in isolation. The laureates may have picked the jewels from the crown, but those jewels were made possible by decades of work by scientific teams around the world.

Neutrino research offers a particularly telling example. The concept of the neutrino itself is almost a century old—Austrian physicist Wolfgang Pauli first proposed the particle in 1930, but it was not until 1956 that American physicists Frederick Reines and Clyde Cowan experimentally detected neutrinos using a nuclear reactor. With this year's award, the Nobel Prize in Physics has now directly honored neutrino research five times, involving nine laureates.

Today's Nobel-winning IceCube research rests on the work of hundreds, if not thousands, of physicists over nearly a century. And even as Halzen receives the Nobel Prize, research teams around the world continue to push the frontiers of neutrino physics. Their work deserves attention in its own right.

Chinese scientist Wang Yifang, for example, led the Daya Bay Reactor Neutrino Experiment, which in 2012 precisely measured θ_{13} , the last unknown neutrino mixing angle, opening the way for further investigation into the fundamental properties of neutrinos. He later led the development of the Jiangmen Underground Neutrino Observatory, or JUNO, which is seeking answers to fundamental questions such as how the masses of the three neutrino states are ordered. In 2026, JUNO reported evidence favoring the normal neutrino mass ordering—itsself a world-class scientific achievement.

And neutrino physics is only one of the many fields in which groundbreaking work could potentially merit a Nobel Prize in Physics. Chinese condensed-

matter physicist Xue Qikun, for example, was listed by some media outlets and prediction platforms as a potential candidate for this year's prize. His team made the first experimental observation of the quantum anomalous Hall effect in 2013. In 2024, his team also found that when iron selenide, or FeSe, is made into a film just one unit cell thick and grown on a strontium titanate, or SrTiO₃, substrate, the interface can greatly enhance its superconducting properties.

All of these studies, like those of the Nobel laureates, are advancing the frontiers of human knowledge. The scientists behind them deserve no less attention and applause simply because their work has not been recognized with a Nobel Prize.

There is also an uncomfortable reality: Nobel science laureates still come overwhelmingly from developed countries. There is no evidence that this reflects bias on the part of the Nobel committees. Developed countries generally provide better research infrastructure and conditions, giving scientists greater opportunities to pursue cutting-edge work. Those advantages can, in turn, attract scientific talent from developing countries. This year, for example, Chinese mathematicians Wang Hong and Deng Yu received the Fields Medal, mathematics' highest honor, while working in France and the United States respectively—a concrete illustration of such global flows of scientific talent.

But that is precisely why the imbalance deserves more attention. Developing countries are playing an increasingly important role in the global economy, politics, and scientific research. Scientists from those countries should likewise have a greater voice and greater visibility in the global scientific community.

Unlike the often controversial Nobel Peace Prize, the Nobel science prizes

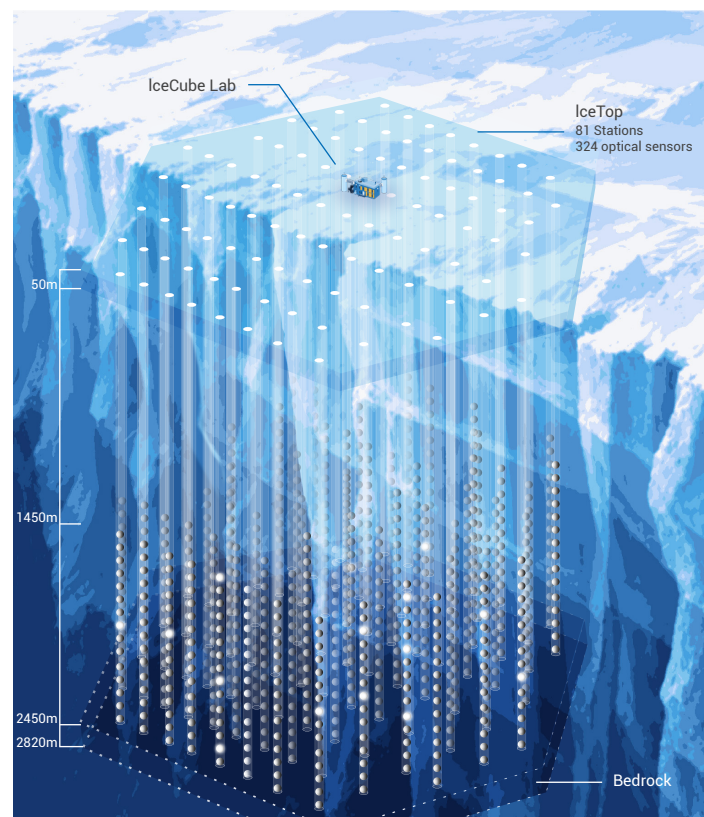


Figure 1. Illustration of the IceCube Neutrino Observatory.

have long enjoyed exceptional credibility for recognizing some of the people whose work has contributed most profoundly to the advancement of human knowledge and for highlighting important directions in fundamental research.

That credibility is worth preserving. And one way to strengthen it is to ensure that the global scientific ecosystem becomes more inclusive and more equitable—so that outstanding minds, wherever they happen to be born

or work, have the opportunity, resources, and recognition they need to push forward the frontiers of human knowledge.

DECLARATION OF INTERESTS

The author declares no competing interests.