

Ghost Particles That Recognize No Barriers

2026 Nobel Prize in Physics: Ghost Particles Pervading the Universe

As you read this article, approximately one hundred trillion ghost particles are passing through your body every second, yet you do not feel them... The reason is that these particles, called ghosts, do not interact with anything they encounter, including your body; in other words, they virtually pass straight through matter. Scientists call these “ghost particles” neutrinos.

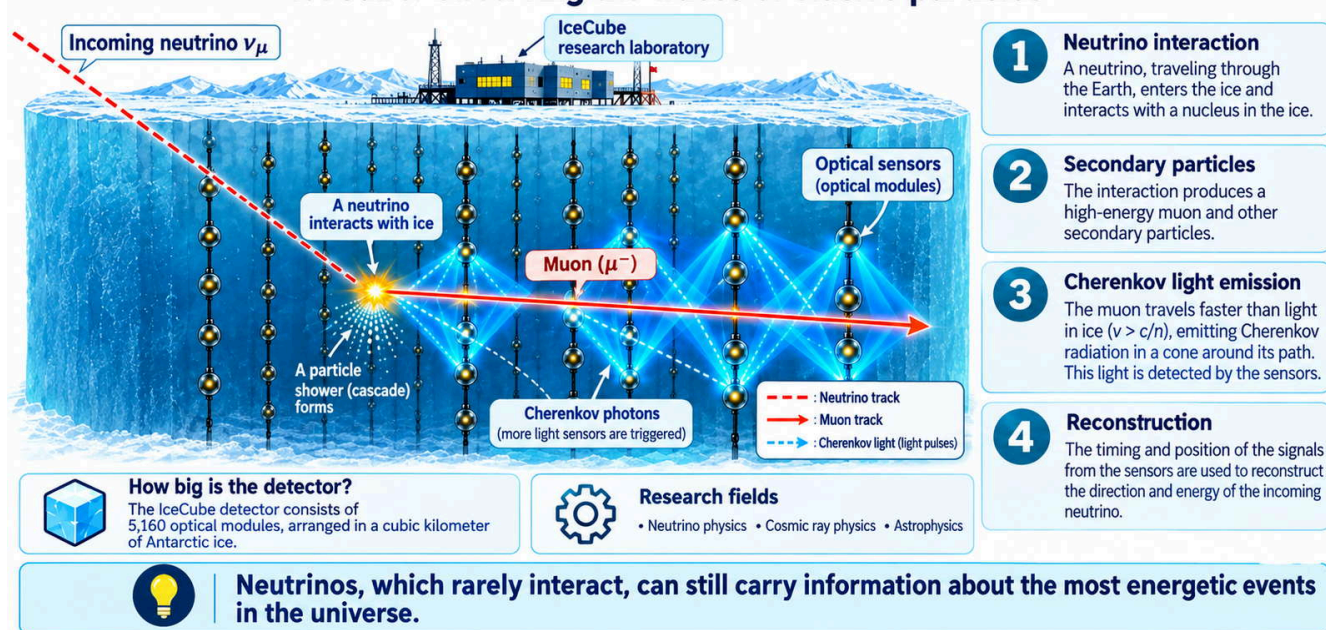
The Ghost Particle Neutrino

In general terms, neutrinos are ‘packets of pure cosmic energy’ scattered around by nuclear explosions in the universe (the Sun and stars), moving slightly slower than light, with nearly zero weight and no electric charge.

As is known, everything around us consists of atoms, and atoms consist of smaller building blocks. Although the neutrinos that pervade the universe are not among the basic components of stable atomic structures, they are among the least understood fundamental particles coming from the farthest corners of the universe. That is because they have no electric charge, their mass is exceedingly small and they interact with almost no matter. Most come from the Sun. A neutrino can easily pass through a wall of lead one light-year thick (9.5 trillion km).

DO NEUTRINOS TRAVEL THROUGH EVERYTHING?

IceCube: Observing the traces of elusive particles



In 1930, physicist Wolfgang Pauli proposed that such a particle must exist to explain the 'missing energy.' Neutrinos were first detected in the mid-1950s. Yet although knowing that they existed was an important development, identifying them by sight directly would be a major step.

What Is Missing Energy?

The "**missing energy**" referred to here was a mysterious decrease in explosions in the atomic nucleus that appeared to contradict the most fundamental law of the universe: "energy cannot be created from nothing, and existing energy cannot be destroyed." In experiments, some of the energy appeared to vanish into thin air; Pauli, however, had realized that this energy did not actually disappear but was secretly carried away by a ghost particle.

Why Is It So Difficult to Capture?

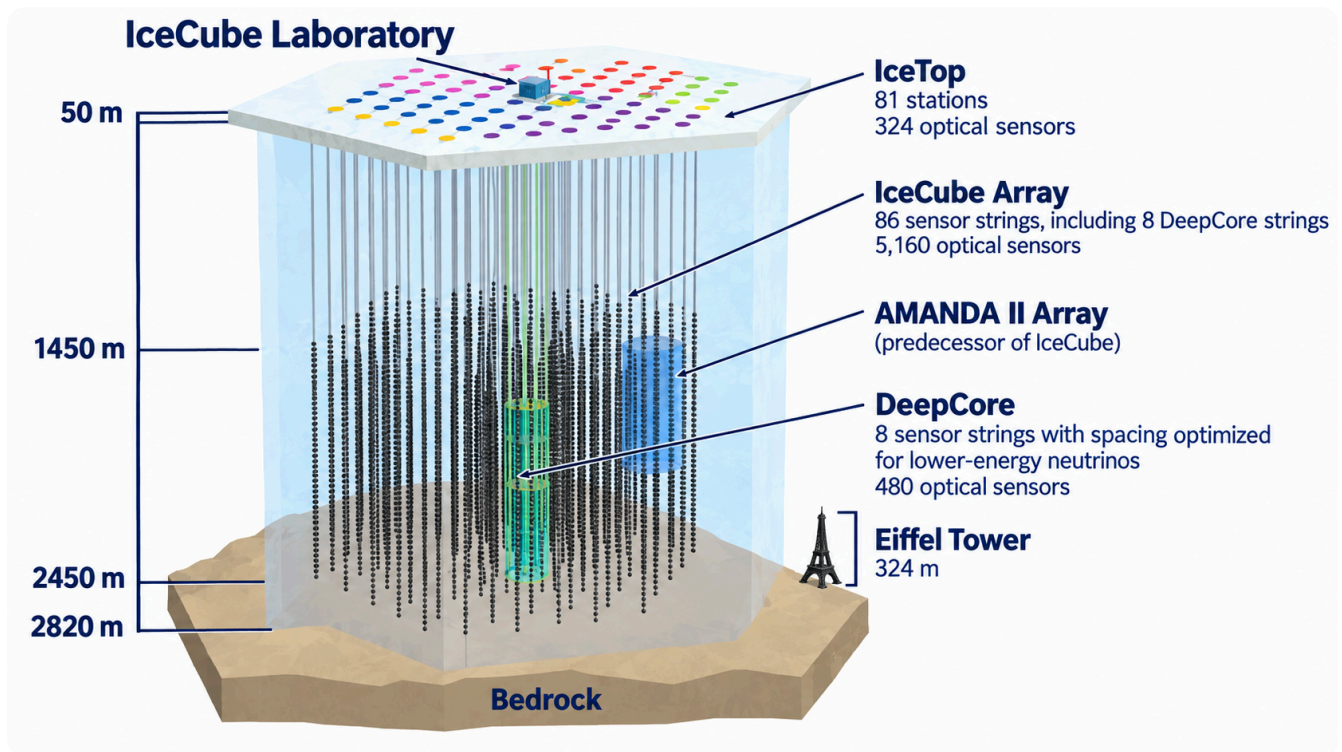
We normally observe the universe through light. Yet along the way, light encounters clouds of dust and gases and is obstructed or deflected. Nothing, however, can obstruct a neutrino; they emerge from the most violent cosmic events and reach us directly, preserving both their direction and the energy they carry.

There was a question scientists had been unable to solve for more than a century: Cosmic rays of incredible energy rain down on Earth from space, but since they are electrically charged, they constantly change direction in magnetic fields. For this reason, their origin could not be determined. Since neutrinos are uncharged, they travel in a straight line and can indicate the location of the source.

The Observatory Inside the Ice

For this reason, physicists strove for years to capture them. The answer to this search was found at the South Pole. At the IceCube Observatory, boreholes were drilled into the ice at depths of between 1.5 and 2.5 kilometers. Approximately 5,000 sensors that are exceedingly sensitive to light were lowered into these boreholes in string-like arrays. This process at the observatory was completed at the end of 2010.

The logic behind the method was this: As trillions of neutrinos flow through the ice, on very rare occasions one of them may strike an atomic nucleus in the ice. This collision produces a charged particle. Since the particle travels very rapidly through the ice, it emits a very faint blue light known as Cherenkov radiation. The sensors in the depths record this light. The direction from which the neutrino came is calculated from the path followed by the light, and how much energy it possessed is calculated from its brightness.



There was a special reason for choosing ice; the pristine ice, kilometers thick, was both an enormous 'target' for neutrinos and served as a dark laboratory that allowed light to pass through. The thick layer above it could also easily filter out noise coming from the outside world.



Three Major Discoveries in Ten Years

In 2013, high-energy neutrinos coming not from the Sun but from the depths of the universe were conclusively observed for the first time. This marked the actual birth of neutrino astronomy.

In 2017, the direction from which a neutrino arrived was matched with a distant blazar (a galaxy with a supermassive black hole at its center that emits rays). The same event was also observed with gamma-ray telescopes. Thus, a probable source of cosmic rays was observed for the first time.

In the following years, neutrinos coming from another active galaxy (NGC 1068) and from the plane of our own galaxy, the Milky Way, were also identified.

What Is the Contribution of This Development to Science?

This development constitutes important data supporting the theoretical foundation in the fields of astrophysics and fundamental physics. The findings obtained will contribute to the study of phenomena such as the dynamics of black holes, supernova explosions and the origin of cosmic rays. Thanks to this development, the universe will be analyzed not only through data from electromagnetic radiation (light), but also through data obtained from neutrino detectors.

On the other hand, the fact that neutrinos interact with matter almost not at all offers the potential for uninterrupted global communication in the future in extreme environments, such as the deep sea or underground, where conventional radio signals (Wi-Fi, 5G, radars) cannot penetrate. At the same time, since they can enter from one side of the Earth and emerge from the other, they will pave the way for mapping the planet's internal structure (its core, magma layers and mineral deposits) as if taking an X-ray.

Conclusion

The discovery of neutrinos and the role these particles play in the universe is not merely a discovery; it is also proof of the existence of a delicate balance in the universe, from atoms to planets.

The nearly massless nature of these particles, which are among the most fundamental building blocks of the universe, that preserve cosmic nuclear balances, and their weak interaction

characteristics are clear evidence that the universe did not come into existence by chance, as materialism claims.

All these developments show that the universe was flawlessly created by our Lord with conscious design and a delicate order. Our Almighty Lord, Who encompasses all things and possesses infinite knowledge, created the universe upon a flawless order from the very first second and continues to create at every moment.

"Do you not see that God has subjected to you everything in the heavens and Earth and has showered His blessings upon you, both outwardly and inwardly? Yet there are people who argue about God without knowledge or guidance or any illuminating Book." (Surah Luqman, 20)

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