NOBEL PRIZE ISSUE

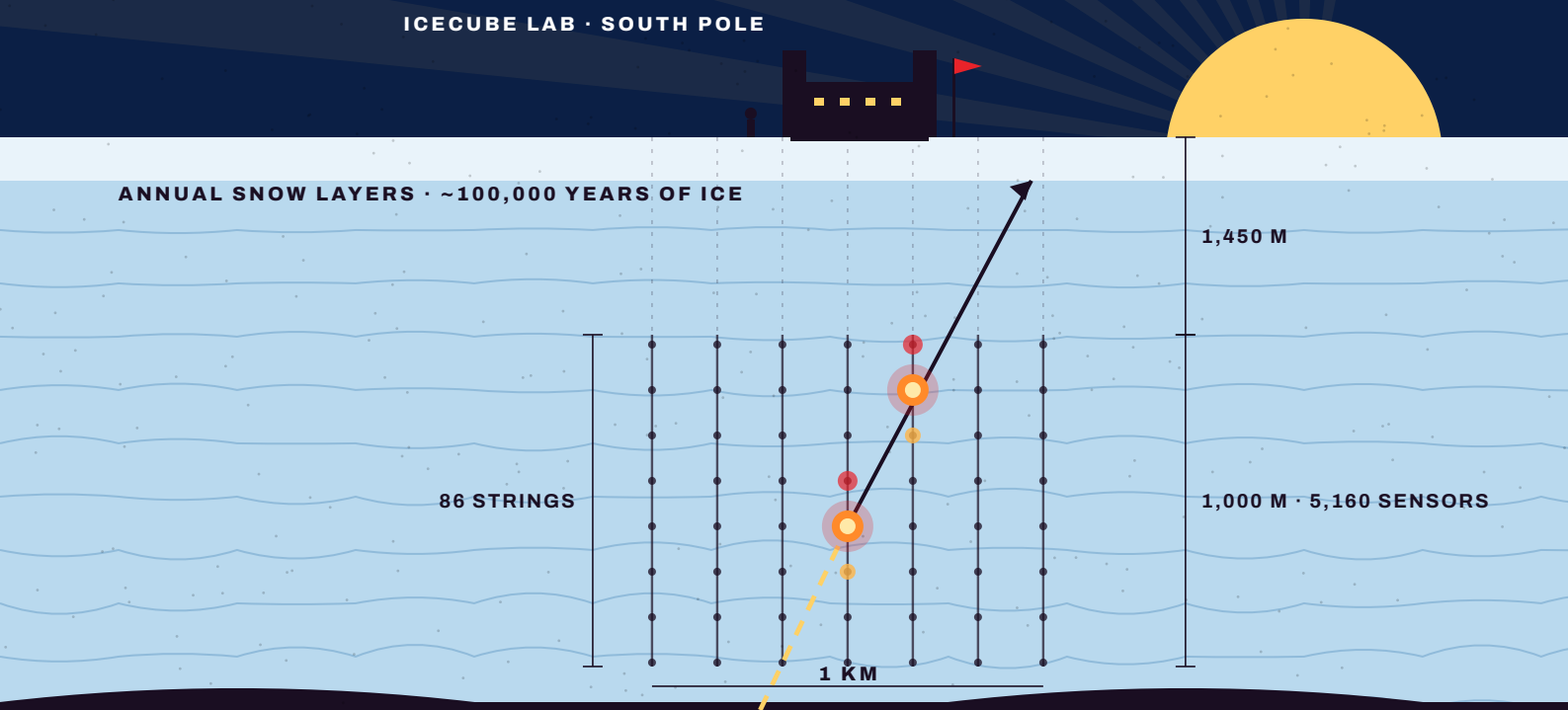
VOL. III · NO. 9 · SEPTEMBER 2026

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PHYSICS PULSE

Your monthly physics digest

Department of Physics · IIT (ISM) Dhanbad



COVER STORY

CATCHING GHOSTS IN THE ICE

Francis Halzen wins the 2026 Nobel Prize in Physics for IceCube, the Antarctic detector that caught high-energy neutrinos from deep space.

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A Nobel for the ghost hunters of the South Pole

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How do you catch a neutrino in a cubic kilometre of ice?

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DEPARTMENT OF PHYSICS · IIT (ISM) DHANBAD · VOL. III · NO. 9 · SEPTEMBER 2026

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THE NOBEL IN NUMBERS

1 km³
of Antarctic ice instrumented, about a billion tonnes

5,160
light sensors on 86 strings, 1,450–2,450 m deep

14
countries in the IceCube collaboration led by Halzen

4 bn
light-years to the blazar TXS 0506+056, the first identified source

FROM THE EDITORS

Welcome to the September edition of Physics Pulse. This month belongs to the neutrino: the 2026 Nobel Prize in Physics has gone to Francis Halzen for IceCube, the detector that turned a cubic kilometre of Antarctic ice into a telescope. Our cover story reports the prize, and Physics Explained walks through how a particle that barely touches matter can still be caught. Closer to home, Dr. Rahul Gupta joins the advisory board of an international magnonics conference, the institute marks Hindi Month, and we look back at three September milestones, including IceCube's own breakthrough alert of 2017. We hope you enjoy reading.

WRITTEN BY AI *The numbers were counted by an AI. It has 0 fingers, so we double-checked.*

PHYSICS NEWS

COVER STORY · NOBEL PRIZE IN PHYSICS 2026

A Nobel for the Ghost Hunters of the South Pole

6 OCTOBER 2026 · ROYAL SWEDISH ACADEMY OF SCIENCES

The 2026 Nobel Prize in Physics has been awarded to **Francis Halzen** of the University of Wisconsin–Madison "for decisive contributions to the IceCube Neutrino Observatory and the discovery of high-energy neutrinos of astrophysical origin." He is the sole laureate, a rarity in recent decades.

Neutrinos are the most elusive of the known particles. Trillions pass through each of us every second, almost never interacting with anything. Halzen's idea was to use the clearest natural material on Earth, the deep glacial ice of the South Pole, as the detector. He proposed IceCube to the US National Science Foundation in 1999 and led a collaboration from 14 countries to build it.

The finished instrument, completed in 2010, is a cubic kilometre of ice between 1,450 m and 2,450 m below the surface, threaded with 86 strings carrying 5,160 light sensors. When a neutrino does strike an atomic nucleus, the charged particle it produces leaves a faint flash of blue Cherenkov light, which the sensors record.

In 2013 IceCube reported the first high-energy neutrinos from beyond the Solar System, and in 2017 it traced one back to a flaring galaxy four billion light-years away. "His tenacity and scientific vision has paved the way for a new kind of astronomy," said Mark Pearce, chair of the Nobel Committee for Physics.

READ MORE: NOBELPRIZE.ORG/PRIZES/PHYSICS/2026

THE LAUREATE



Francis Halzen. Illustration: Niklas Elmehed © Nobel Prize Outreach

BORN	1944, Tienen, Belgium
PH.D.	1969, KU Leuven
POST	Professor, University of Wisconsin–Madison; Principal Investigator, IceCube
PRIZE	12 million Swedish kronor, sole laureate

ALSO THIS YEAR

Light Switches for Neurons, and the Origin of Handedness

The **Physiology or Medicine** prize went to Karl Deisseroth, Peter Hegemann and Georg Nagel for optogenetics: light-gated ion channels that let researchers switch individual neurons on and off with a beam of light.

The **Chemistry** prize was shared by Henri B. Kagan and Kenso Soai for work on molecular chirality, including a self-amplifying reaction that hints at how life came to prefer one mirror image over the other.

WRITTEN BY AI

No neutrinos were harmed. Like one, our AI passed straight through the press releases without interacting with a single cup of chai.

HOW DO YOU CATCH A NEUTRINO IN A CUBIC KILOMETRE OF ICE?

BEHIND THE NOBEL PRIZE

Why neutrinos are worth the trouble. Light, X-rays and radio waves are absorbed or scattered as they cross the universe, and charged cosmic rays are bent by magnetic fields, so they do not point back to their source. Neutrinos do neither. They carry no charge and interact only through the weak force, so a neutrino made in a distant galaxy arrives here on a straight line, unchanged. That is why Halzen called them the ideal cosmic messenger.

The catch. The same indifference that lets a neutrino cross the universe lets it cross the Earth. To see even a handful of high-energy cosmic neutrinos a year, you need an enormous target. A cubic kilometre of matter weighs about a billion tonnes. No one can build a tank that size, but the Antarctic ice sheet is already there, nearly three kilometres thick and, below about 1,400 m, among the clearest solids on Earth.

The flash. Very occasionally a neutrino hits a nucleus in the ice and produces a charged particle, often a muon, moving faster than light travels in ice. Just as a boat moving faster than water waves makes a wake, the particle sheds a cone of blue light called **Cherenkov radiation**. IceCube's 5,160 basketball-sized sensors, frozen into holes drilled with hot water, time each flash to a few billionths of a second.

Reading the pattern. A muon leaves a long straight track of light, which fixes the neutrino's direction to within about a degree. Other neutrino flavours produce a compact ball of light, a cascade, which gives a better energy measurement but a poorer direction. Bubble size and colour in our cover drawing follow IceCube's own convention: bigger bubbles collected more light; red sensors fired first, blue last.

Looking down to see up. Muons made by cosmic rays in the atmosphere rain down on the detector a million times more often than neutrinos arrive. IceCube's trick is to look through the Earth: a track coming *up* out of the bedrock can only have been made by a neutrino, since nothing else survives the journey through the planet.

THREE RESULTS THAT MADE THE CASE

2013	**28 events** above 30 TeV, far more than the atmosphere can explain: the first evidence of neutrinos from beyond the Solar System.
2017	A 290 TeV neutrino alert on 22 September led telescopes to a flaring **blazar, TXS 0506+056**: the first identified cosmic neutrino source.
2023	A neutrino image of the **Milky Way** itself, seeing our galaxy for the first time in something other than light.

WRITTEN BY AI *Our AI catches neutrinos about as often as IceCube does: rarely, and only with a lot of help from humans.*

DEPARTMENT NEWS

FACULTY · HONOUR

Dr. Rahul Gupta Elected to the Scientific Advisory Board of TRTM 2027 and TRTM 2028



Dr. Rahul Gupta (holding the microphone) on the panel "Artificial Intelligence in Science: Where Are the Ethical Boundaries?" at TRTM 2026.

Dr. Rahul Gupta, an Assistant Professor in the Department of Physics, Indian Institute of Technology (Indian School of Mines) Dhanbad, has been elected to serve on the Scientific Advisory Board of the Transnational Round Table on Magnonics (TRTM) conference for 2027 and 2028, for a two-year term.

The election took place during the TRTM 2026 International Conference, where Dr. Gupta also delivered an invited talk titled "Orbital Angular Momentum-Driven Memory, Oscillators, and Terahertz Devices." His presentation highlighted the emerging potential of quantum angular momentum, particularly spin and orbital angular momentum, in the development of next-generation energy efficient electronic devices, including non-volatile memory, high-frequency oscillators, and terahertz technologies.

During the conference, Dr. Gupta was also invited to participate in a panel debate titled "Artificial Intelligence in Science: Where Are the Ethical Boundaries?", alongside other distinguished invited speakers. The discussion explored the growing role of artificial intelligence (AI) in scientific research, its potential to accelerate scientific discoveries, and the importance of maintaining scientific integrity, critical thinking, transparency, and human oversight. Dr. Gupta emphasized that AI should serve as a powerful tool to enhance scientific understanding rather than replace fundamental scientific reasoning. He also drew attention to the substantial energy demands of AI hardware, highlighting the need to address environmental sustainability alongside technological advancement.

Building on this vision, Dr. Gupta aims to further develop **GHYAN (ज्ञान) Lab** (Gupta Laboratory for Hybrid QuAntum Systems & SpiNtronics) at IIT (ISM) Dhanbad as a research initiative dedicated to exploring quantum-mechanical phenomena, particularly spin and orbital angular momentum transport, for next-generation energy-efficient computing and quantum sensing technologies.

The GHYAN (ज्ञान) Lab's research vision encompasses spintronic and orbitronic approaches to low-power memory, information processing, sustainable AI hardware, and advanced quantum sensing platforms. By integrating fundamental quantum physics, hybrid quantum systems, advanced materials, and device engineering, GHYAN (ज्ञान) Lab seeks to bridge fundamental scientific discoveries with practical technological applications, contributing to the development of sustainable computing architectures and emerging quantum technologies.

Dr. Gupta warmly welcomes enthusiastic and motivated students and researchers from IIT (ISM) Dhanbad and other institutions to join GHYAN (ज्ञान) Lab and contribute to this research vision. He encourages young researchers interested in quantum physics, spintronics, orbitronics, quantum materials, quantum sensing, and energy-efficient AI hardware to participate in collaborative research aimed at developing innovative and sustainable technologies for the future.

Links: TRTM 2026 · TRTM 2027 Scientific Advisory Board · GHYAN Lab: ghyanlab.github.io

INSTITUTE · 1–30 SEPTEMBER

Hindi Month at IIT (ISM) Dhanbad

As directed by the Ministry of Education, the institute observed **Hindi Month** from 1 to 30 September 2026, with competitions in impromptu speech, Hindi commentary and drafting, essay writing, debate, Official Language Policy and translation for staff and students, plus student contests on youth and a developed India.

RESEARCH PUBLICATIONS

1 **S. K. Rasool, S. Jimkeli Singh, Stacy A. Lynrah, Asit Kumar Kar, Selvakumar Selliyan, A. Elayaperumal and P. Chinnamuthu**

Enhanced NH_3 sensing using a MoO_3 thin film/TiO_2 nanopillars heterostructure-based chemiresistive sensor

Journal of Materials Science (2026) · DOI: 10.1007/s10853-026-13611-0

THIS MONTH IN PHYSICS HISTORY

14
SEPTEMBER 2015

LIGO Hears Two Black Holes Collide

At 09:50:45 UTC the two LIGO detectors, in Louisiana and Washington, recorded a chirp lasting a fifth of a second: the signal from two black holes of about 36 and 29 solar masses merging 1.3 billion light-years away.

Announced the following February, **GW150914** was the first direct detection of gravitational waves and the first observation of a binary black hole merger. It earned the 2017 Nobel Prize in Physics.

22
SEPTEMBER 2017

IceCube Points Telescopes at a Blazar

A single neutrino of about 290 TeV set off IceCube's alert system 43 seconds after it arrived. Within hours, telescopes on the ground and in space, including Fermi and MAGIC, were looking in the same direction and found the blazar **TXS 0506+056** in a flare.

It was the first time a high-energy neutrino had been matched to a source in the sky, and a landmark for multi-messenger astronomy. The result is a cornerstone of this year's Nobel Prize.

23
SEPTEMBER 1846

Neptune Is Found Where the Mathematics Said It Would Be

Urbain Le Verrier, working only from irregularities in the orbit of Uranus, predicted where an unseen planet must lie. Johann Galle in Berlin pointed his telescope at the spot the night he received the letter and found **Neptune** within one degree of the prediction.

It remains the clearest example of a planet discovered by calculation before observation, and a triumph of Newtonian gravity.

WRITTEN BY AI *Compiled by an AI that has no memory of 1846 but is suspiciously confident about the dates.*

JOB & FUNDING OPPORTUNITIES

INSPIRE Faculty Fellowship

DST · for young Ph.D. holders

Five-year fellowship with a research grant for researchers under 32 to begin an independent career at an Indian institution.

CHECK PORTAL FOR CURRENT CALL

online-inspire.gov.in

Fulbright-Nehru Academic and Professional Excellence

USIEF · for faculty and researchers

Teaching and research awards for Indian academics to spend four to nine months at a US institution.

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usief.org.in

Ramanujan Fellowship

ANRF · for Indian scientists returning from abroad

Supports scientists of Indian origin working overseas who want to take up research positions in India.

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anrf.gov.in

National Postdoctoral Fellowship (N-PDF)

ANRF · for early-career Ph.D. holders

Two-year postdoctoral fellowships hosted at Indian institutions for recent doctorates.

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anrfonline.in

Prime Minister Early Career Research Grant

ANRF · for early-career faculty

Helps researchers in their first faculty years set up independent groups.

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anrfonline.in

Prime Minister Research Fellows (PMRF)

Ministry of Education · for Ph.D. scholars

Enhanced fellowship and research grant for doctoral students at IITs, IISc and other leading institutions.

CHECK PORTAL FOR CURRENT CALL

pmrf.in

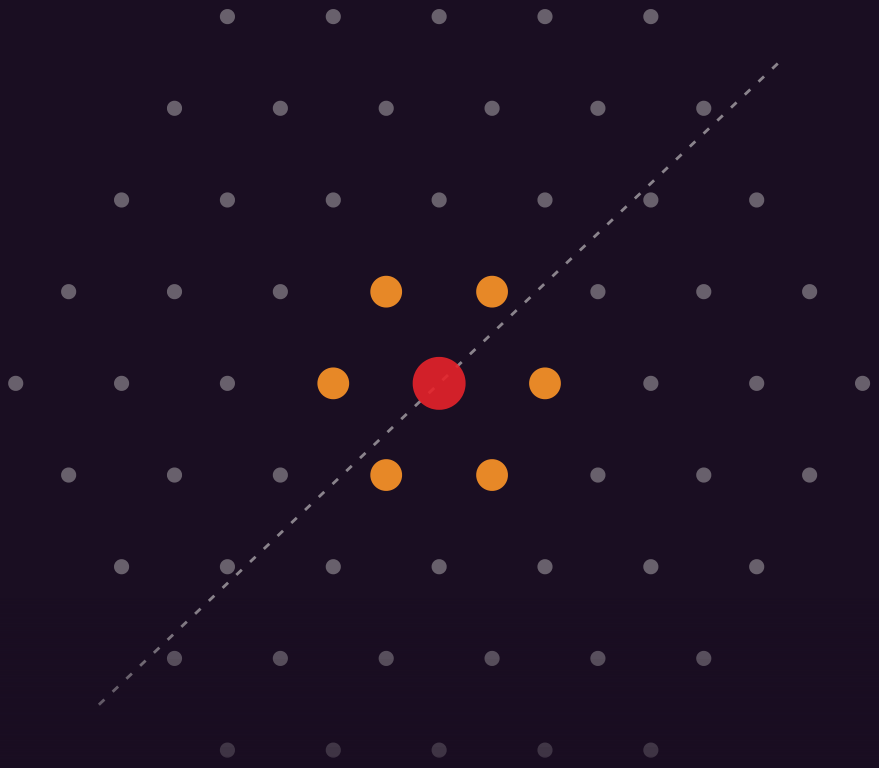
Calls open and close through the year. Check each official portal for current deadlines and eligibility before applying. Know of an opening? Send it through the newsletter form.

“

I HAVE DONE A TERRIBLE THING. I HAVE POSTULATED A PARTICLE THAT CANNOT BE DETECTED.

WOLFGANG PAULI · ON PROPOSING THE NEUTRINO, 1930

IT TOOK 26 YEARS TO DETECT THE FIRST ONE, AND 83 TO SEE ONE FROM DEEP SPACE



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