DEPARTMENT OF PHYSICS · IIT (ISM) DHANBAD

VOL. III · NO. 6 · JUNE 2026

PHYSICS PULSE

THE MONTHLY NEWSLETTER OF THE DEPARTMENT OF PHYSICS

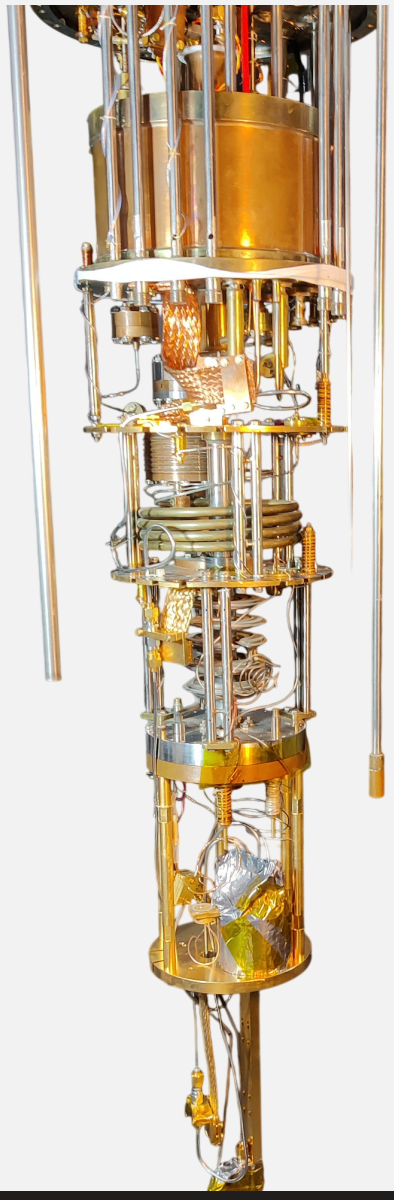
QUANTUM ISSUE

QUANTUM COMPUTING · SIMULATING NATURE

Making Nature Compute

Forty years after Feynman's challenge, quantum computers are learning to simulate the systems no classical machine can — from molecules to matter itself.

PAGE 04



ON THE COVER

A dilution refrigerator: the workhorse of quantum hardware, cooling circuits to a few thousandths of a degree above absolute zero so their quantum states survive long enough to be measured.

Photograph courtesy of Rojas Lab, Royal Holloway, University of London

PHYSICS PULSE

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IN THIS ISSUE

FROM THE EDITORS

Welcome to the June edition of Physics Pulse. This month we look at how quantum computers are beginning to simulate Nature itself, celebrate a busy season of conferences and publications from our research scholars, and revisit three June milestones in the history of physics. We hope you enjoy reading.

PHYSICS NEWS

QUANTUM COMPUTING

Google Funds a $10M Bet on Quantum Biology

SUBMITTED BY MOHANA PRIYA T.

Google has launched a **$10-million** initiative called **REPLIQA** (Research Program at the Intersection of Life Sciences and Quantum AI) to explore how quantum computing and AI can be applied to biological systems. The funding is distributed across leading institutions including Harvard, MIT, UC San Diego, UC Santa Barbara, and the University of Arizona.

The core motivation is that biological processes such as protein folding, enzyme reactions, and molecular interactions are governed by quantum mechanics, yet are extremely hard to simulate on classical computers because of their exponential scaling. Quantum computers, in principle, can represent these systems far more naturally.

The program focuses on three areas: quantum simulation of molecules for drug discovery, quantum sensing for ultra-sensitive biological measurements, and quantum-enhanced AI for complex biological data analysis.

It is a long-term research effort rather than a near-term product. The goal is to learn whether quantum systems can realistically improve biological modelling — and perhaps reveal deeper physical principles underlying life itself.

READ MORE: THE QUANTUM INSIDER

SOLAR PHYSICS

Solar Orbiter Captures the Sun's South Pole

SUBMITTED BY RISHIT RAJ

The European Space Agency has released the first-ever images of the **Sun's south pole**, captured by the *Solar Orbiter* spacecraft as it dipped below the solar equator — a vantage point no mission had reached before.

The joint ESA–NASA mission, launched in 2020 at a cost of about $1.3 billion, revealed a chaotic mosaic of north and south magnetic patches near the pole, offering key clues to how the Sun's magnetic field flips roughly every 11 years.

Captured during the current solar maximum, when sunspots and flares peak, the data will sharpen our understanding of polar magnetic dynamics and space-weather forecasting. Solar Orbiter will tilt its orbit further — to 24° by December 2026 and 33° by mid-2029 — for still better views.

READ MORE: ESA · SOLAR ORBITER

PHYSICS EXPLAINED

MAKING NATURE COMPUTE

01

By Physics Pulse Desk

In 1981, at a now-legendary conference, Richard Feynman posed a challenge that still defines a field.

“The road to a useful quantum computer is long and uncertain — but the destination is the one Feynman sketched long ago.”

“Nature isn’t classical, dammit, and if you want to make a simulation of Nature, you’d better make it quantum mechanical.” His point was simple but profound — the world is quantum, and a machine built to imitate it should be quantum too.

The trouble is scale. Describing a system of just a few hundred interacting quantum particles requires more numbers than there are atoms in the observable universe. Every particle you add doubles the bookkeeping, so even the largest classical supercomputers quickly drown in the exponential growth of quantum possibilities — precisely the systems that chemists and materials scientists most want to understand.

A quantum computer sidesteps this by speaking the same language as the problem. Its basic unit, the **qubit**, can hold a superposition of 0 and 1 at once; link many qubits through **entanglement** and the machine naturally represents the vast web of correlations a molecule or a magnet carries. Rather than store the quantum state in memory, it lets the state live directly in the hardware.

Four decades on, Feynman’s vision is being tested in earnest. Today’s *noisy* quantum processors — dozens to hundreds of qubits — are already simulating small molecules, exotic phases of matter, and toy models of high-energy physics, while steady progress in error correction edges the field toward larger, fault-tolerant machines. The promise is not faster arithmetic, but access to questions no classical computer can reach.

The pull is practical as well as fundamental. This month’s news that Google has committed $10 million to a “quantum biology” programme — probing protein folding, enzymes and drug molecules with quantum simulation — is a sign that industry now takes the long game seriously. Quantum sensing and quantum-enhanced machine learning ride alongside, each hunting for a corner where quantum hardware genuinely wins.

For a department like ours, where low-temperature experiments, superconducting circuits and optomechanical resonators already sit close to the quantum edge, the message is encouraging. The road to a useful quantum computer is long and uncertain — but the destination is the one Feynman sketched long ago: a machine that does not merely calculate *about* Nature, but computes as Nature does.

A Physics Pulse explainer, marking forty years of Feynman’s call for quantum simulation.

THIS MONTH IN PHYSICS HISTORY

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JUNE 1963

Valentina Tereshkova, First Woman in Space

On 16 June 1963, **Valentina Tereshkova** became the first woman to travel into space aboard *Vostok 6*, launched by the Soviet Union from the Baikonur Cosmodrome.

The mission lasted 2 days, 22 hours and 50 minutes, during which she completed 48 orbits of Earth and travelled nearly 2 million kilometres — demonstrating that women could endure spaceflight and providing valuable data for future human missions.

30

JUNE 1908

The Tunguska Event

On 30 June 1908, a powerful atmospheric explosion occurred over Siberia near the Tunguska River, widely believed to have been caused by a meteoroid exploding before reaching the ground.

The blast released energy estimated at 3–30 megatons of TNT, flattening nearly 2,000 square kilometres of forest and felling an estimated 80 million trees. It remains one of the most studied natural events in astrophysics.

JUNE 1936

An Early European Cyclotron

In June 1936, one of Europe's earliest **cyclotrons** entered scientific operation. A cyclotron accelerates charged particles using alternating electric fields and a strong magnetic field that forces them into a spiral path.

It let particles reach far higher energies than earlier methods, opening the way to investigate atomic nuclei, study nuclear reactions, and probe the structure of matter.

DEPARTMENT NEWS

STUDENT RESEARCH · 44TH ASI MEETING

Scholars Present at the Astronomical Society of India Meeting

15–19 MAY 2026 · IIT GUWAHATI

Three research scholars from the department presented posters at the **44th Annual Meeting of the Astronomical Society of India (ASI 2026)**, held at IIT Guwahati. **Tanuj Datta**, a second-year Ph.D. scholar under Prof. Esha Kundu, presented his work titled *"Investigating LMXRBs as plausible progenitors of GC FRB 20200120E."*

Aditya Pandey *("Probing Type Ia Supernova Using Double-Detonation Models")* and **Rajdeep Sarkar** *("Multiwavelength study of compact objects in MAVERIC globular clusters")*, also working with Prof. Esha Kundu, presented their research at the same meeting, which brought together astronomers and astrophysicists from across the globe. Aditya's participation was partially funded by the ASI 2026 organising committee.

STUDENT RESEARCH · ICTP TRIESTE

Sudhanshu Arya at the ICTP–IAEA Plasma School

4–8 MAY 2026 · ICTP, ITALY

Sudhanshu Arya, working under Prof. Bobby Antony, participated in the *Joint ICTP–IAEA School on Atomic and Molecular Processes in Plasmas* at the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

STUDENT RESEARCH · SOFT MATTER

At the 10th International Soft Matter Conference

22–29 MAY 2026 · BITS PILANI, GOA

Vhaskar Chakraborty, **Anyesha Das** and **Rohit Biswas**, research scholars in the group of Prof. Pankaj Mishra, attended the *10th International Soft Matter Conference (ISMC 2026)* at BITS Pilani, Goa, along with its associated Mini-Schools on Active Matter and Computational Soft Matter.

FACULTY · IIT MADRAS

Prof. R. B. Choudhary Completes the Nurturing Future Leadership Programme

18–22 MAY 2026 · IIT MADRAS

Prof. R. B. Choudhary receiving the NFLP certificate at IIT Madras.

Prof. Ram Bilash Choudhary completed the *Nurturing Future Leadership Program (NFLP), Batch 8*, held from 18–22 May 2026 at the Department of Management Studies, IIT Madras, under the **Malaviya Mission Teacher Training Programme** of the Ministry of Education.

JOB OPPORTUNITIES

Rhodes Scholarship — Open Call

Rhodes House, University of Oxford · fully-funded postgraduate study

rhodeshouse.ox.ac.uk/scholarships

Scientific Officer & Scientific Assistant

TIFR, Mumbai

tifr.res.in/maincampus/careers.php

Project Associate — Soft Electrodes for Interfacing Tissues

JNCASR, Bengaluru

jncasr.ac.in/openings

R&D — Device Engineering (PMTS)

Tata Group Semiconductor Foundry

linkedin.com/jobs/view/4244600543

Engineering Internships (Fab / Supply Chain / Design)

GlobalFoundries

linkedin.com/jobs/view/4096981523

Semiconductor Manufacturing Materials Expert

Semiconductor manufacturing (wafers, gases, photoresists)

linkedin.com/jobs/view/4214297519

RESEARCH PUBLICATIONS

1 Zhiwei Peng, Vhaskar Chakraborty, Pankaj Mishra, and Mingfeng Qiu

Dispersion of active particles in oscillatory Poiseuille flow

Journal of Fluid Mechanics (2026) · DOI: 10.1017/jfm.2026.11543

2 Pankaj Mishra, Moushila Bayen, and Rohit Biswas

Tunable freezing in 2D PMMA colloids: density functional theory of combined Yukawa–Hamaker interactions

Physica A: Statistical Mechanics and its Applications (2026) · DOI: 10.1016/j.physa.2026.131578

3 Subhasis Sarangi, Archana Hota, Amritendu Roy, and P. M. Sarun

Structural, electrical, ferroelectric and energy-harvesting performance of $BaV_xSn_{(0.05-x)}Ti_{0.95}O_3$ for self-powered micro-electronic applications

Journal of Alloys and Compounds (2026) · DOI: 10.1016/j.jallcom.2026.189375

4 Priyadarshi Sahoo, Manika Dandapat, Amit Kumar Pradhan, Prasanta Kumar Datta, and Umakanta Tripathy

Nonlinear photophysics of a PDA-based nanofluid: a potential candidate for two-photon photothermal therapy

Nanoscale Advances (2026) · DOI: 10.1039/d6na00128a

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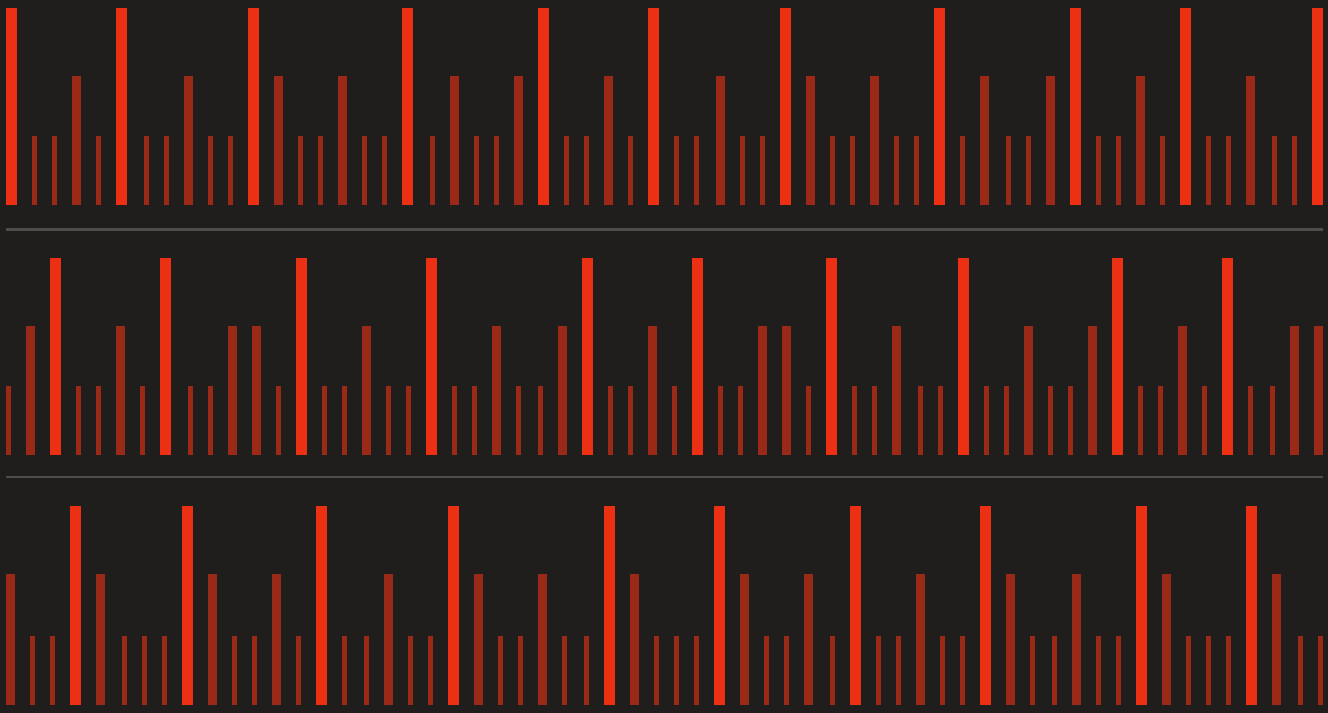
Nature isn’t classical, dammit, and if you want to make a simulation of Nature, you’d better make it quantum mechanical.

RICHARD FEYNMAN · SIMULATING PHYSICS WITH COMPUTERS, 1981



BEAT · MEASURE · INTERFERENCE

FEYNMAN KEPT TIME ON THE BONGOS

GET INVOLVED

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Previous Issues

iitism.ac.in/physics-newsletter

Suggestions

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