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Trio wins Physics Nobel for building device showing 'quantum tunnelling'

Jacob Koshy
NEW DELHI

The Nobel Prize for Physics this year will be awarded to three scientists – John Clarke, Michel Devoret and John Martinis, the Royal Swedish Academy of Sciences said on Tuesday. The three worked together and devised experiments to tease greater insight into the workings of the quantum world: the realm of the ultra-small when objects, broken down to single, constituent particles, cease to behave in the way we ordinarily expect them to.

One of the mind-boggling behaviours that particles are capable of here is "tunnelling", literally, the

Quantum magnified

Nobel for quantum behaviour scaled up

■ The laureates proved that entire electrical circuits can obey quantum mechanical laws

■ They used Josephson junctions to observe tunnelling and energy quantisation in superconducting circuits



JOHN CLARKE MICHEL H. DEVORET JOHN M. MARTINIS



SOURCE: NOBEL PRIZE OUTREACH

ability of particles to pass through physical walls. It is as if a cricket ball hitting the pitch will surely bounce up, but the odd cricket-ball particle will simply burrow into the

ground.

Such strange behaviour cannot be observed at the macroscopic level but these scientists showed that it was possible to organise a multitude of single

particles and coerce them to exhibit "tunnelling" properties.

Electrical circuit

Much like early insight into quantum mechanics paved the way for transistors and silicon chips in the 1950s, the three scientists devised an electrical circuit with two superconductors, components that can conduct a current without any electrical resistance.

They separated these with a thin layer of material – called a Josephson junction – that did not conduct any current at all.

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Trio wins Physics Nobel for building device showing 'quantum tunnelling'

Source: The Hindu, Page 1

Context

Three scientists – John Clarke, Michel Devoret, and John Martinis – have been awarded the 2025 Nobel Prize in Physics for creating a device that demonstrates quantum tunnelling using electrical circuits, proving that even macroscopic systems can follow quantum mechanical laws.

Key terms

1. Quantum Physics

Study of matter and energy at atomic and sub-atomic levels, where particles behave unlike classical objects – showing wave-particle duality, superposition, and probabilistic motion.



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2. Quantum Tunnelling

- It is the ability of particles to pass through a barrier that they classically should not be able to cross.
- Example: A cricket ball hitting a wall would bounce back, but in the quantum world, the ball (particle) might "tunnel" through and appear on the other side.
- It happens because particles behave like waves and can exist beyond physical boundaries momentarily.

3. Josephson Junction

- A Josephson junction is a thin insulating layer placed between two superconductors.
- In ordinary conditions, current cannot flow through the insulator – but due to quantum tunnelling, pairs of electrons (Cooper pairs) can pass through it without resistance.
- It is a fundamental component in quantum computers, superconducting qubits, and precision measurement devices.

What the Scientists Showed:

- The trio proved that entire electrical circuits – not just tiny particles – can also obey quantum mechanical laws.
- They used Josephson junctions to observe tunnelling and energy quantisation in superconducting circuits.

What Was Shown Through Electric Current:

- The scientists showed that electric current in a superconducting circuit could exhibit quantum tunnelling – passing through an insulating barrier without resistance or external energy input.
- This confirmed that quantum mechanics governs even entire electrical systems, not only atomic particles.

Significance:

- Foundation for quantum computing (superconducting qubits).
- Advances quantum sensors and precision devices.
- Enables energy-efficient, resistance-free circuits.
- Bridges microscopic quantum laws with macroscopic systems.
- Paves way for next-gen electronic technologies.

Ahead of Muttaqi's visit, India takes a step closer to recognising Taliban

Suhasini Haidar

NEW DELHI

Two days before the visit of Amir Khan Muttaqi, Acting Foreign Minister of the Taliban regime ruling Afghanistan, the Indian government came one step closer to formally recognising the Taliban, as a regional grouping that India is a part of admitted Mr. Muttaqi as a "member" for the first time.

Mr. Muttaqi, who is on the UN Security Council's list of banned terrorists, was given special permission to travel to India, and officials said he would arrive in Delhi on Thursday for a five-day visit.

According to sources, Mr. Muttaqi will be accord-



Amir Khan Muttaqi

ed full protocol as a visiting Foreign Minister, including being hosted by the government. He will be received at the official venue, Hyderabad House, by External Affairs Minister S. Jaishankar for talks on October 10.

Amidst speculation over

whether India will give the Taliban *de facto* recognition during the visit, former diplomats warned against any move not sanctioned by the UN, while an anti-Taliban former Afghan Minister said the visit must not be used to foster "regional and major power rivalries".

Taliban flag

On Tuesday, India's Ambassador to Russia Vinay Kumar attended the 10-nation Moscow Format Consultations hosted by Russian Foreign Minister Sergey Lavrov. Others in attendance were Pakistan's special envoy on Afghanistan Mohammad Sadiq and other representatives from China, Iran and Central

Asian countries.

Apart from Russia, no country has recognised the Taliban government thus far, and since the Taliban takeover of Kabul in August 2021, representatives of the 'Acting government' in Afghanistan have attended the meeting as observers only. However, a photograph released after the meeting on Tuesday showed Mr. Muttaqi amongst other national delegates, and the Taliban's "black-and-white" flag instead of the red, black, and green tricolour of the previous Afghan republic still recognised by the United Nations.

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Ahead of Muttaqi's visit, India takes a step closer to recognising Taliban

Source: The Hindu, Page 1

Paper: GS Paper 2 – International Relations

Why in News:

India is set to host Amir Khan Muttaqi, the Acting Foreign Minister of the Taliban regime in Afghanistan, marking the first time India has treated a Taliban representative as a "member" of a regional grouping.

India is part of a regional grouping – such as the Moscow Format Consultations or the Regional Dialogue on Afghanistan – and this grouping admitted Taliban ministers as a full "member".

Earlier, Taliban representatives used to attend such meetings only as observers, not as official members, which means India has indirectly (de facto) moved a step closer to recognising the Taliban government.

Why the Visit is Significant:

- **Diplomatic shift:** India had avoided formal engagement since the Taliban takeover (Aug 2021); hosting Muttaqi signals a pragmatic engagement approach.
- **Regional stability:** India aims to safeguard its interests in Afghanistan amid growing influence of Pakistan, China, and Russia.
- **Counterterrorism concerns:** Engagement helps monitor terror threats emanating from Afghan soil.
- **Humanitarian and connectivity goals:** India seeks aid channels and regional trade connectivity via Central Asia.

Recognition Status of Taliban Government:

- **So far:** No country, apart from Russia, has given any form of recognition to the Taliban government.
- **UN status:** The United Nations still recognises the previous Afghan Republic's representative, not the Taliban.

Israel's tactical gains in a strategic labyrinth

Before October 7, 2023, West Asia looked like a different region, at least from a geopolitical perspective. The Palestine question had been pushed to the margins of the region. Palestinians themselves were divided with the Islamist Hamas controlling Gaza and the Fatah running the Palestine Authority in the West Bank. Iran, despite its economic woes, remained a powerful actor through its so-called axis of resistance. The Arab countries, mostly the wealthy Persian Gulf monarchies, saw Iran as a security threat, and chose to deepen security cooperation with Israel.

The United States, seeking to slowly disentangle itself from West Asia, was trying to knit together two of its key regional pillars – the Arab world and Israel – into a joint front against Iran. The foundation of this vision was laid in the Abraham Accords of 2020, brokered by the first Trump administration, through which four Arab countries signed a normalisation agreement with Israel. By 2023, Saudi Arabia was in an advanced stage of normalising ties with Israel.

Washington's broader plan was to integrate Israel deeper into the regional economy as well as the global order with two major initiatives, both involving India – the I2U2 grouping (India, Israel, the U.S. and the United Arab Emirates), and the India-Middle East-Europe Economic Corridor (IMEEC). It was a grand vision to reshape the region under the American leadership with Israel at the heart of what was being hailed as “the new Middle East”. Then came the October 7, 2023 attack by Hamas on Israel, in which about 1,200 people were killed. The attack shattered the sense of security that Israel had seemed to enjoy despite its continued atrocities against Palestinians. Hamas's murderous assault was widely condemned, but the violence also served as a reminder that unless the Palestine question was addressed, peace and stability would remain elusive in West Asia. Israel also realised that the attack sabotaged its efforts to reshape the region in its favour diplomatically. The Israeli response was swift and overwhelming – an all-out war, first focused on Gaza and then spilling into the wider region.

Objectives of the war

Israel declared two primary objectives – the destruction of Hamas and the release of the 251 hostages taken on October 7. But the way it fought the war suggests that it has deeper ambitions. For Israel, Hamas was only the tip of the iceberg. Its real conventional enemy was Iran, which backed Hamas, Hezbollah, Islamic Jihad and other militant groups. After October 7, Israel saw an opening to wage a two-front war – the first was to crush Palestinian resistance once and for all, and the second was to dismantle Iran's axis and weaken its regional influence. Israel's Prime Minister Benjamin Netanyahu wanted the



Stanly Johny

following: to build a unipolar West Asia, with Israel, backed by the U.S., being the central security player; Iran rolled back; Arab countries subdued, and the resurgent Palestine question pushed to the margins.

To be sure, Israel has made some advances in this direction. Hamas's militant and administrative infrastructure have been severely damaged, and Israeli forces control much of Gaza. Even if they withdraw under U.S. President Donald Trump's 20-point “peace” plan to the initial withdrawal lines, Israeli troops will still retain parts of Rafah in the south, much of Khan Yunus and a buffer zone in the north. Hezbollah, the feared Shia militant group in Lebanon, has been humbled by Israel's repeated strikes.

In Syria, the collapse of the Bashar al-Assad regime, and the rise of Abu Mohammed al-Golani (Ahmed al Sharaa), a former al-Qaeda jihadist, marked a tactical victory for Israel. Mr. Assad had been a critical link between Iran and Hezbollah and his fall not only weakened Hezbollah further but also allowed Israel to grab more Syrian territory. Emboldened by these developments, Israel carried out air strikes on Iran in June to destroy its nuclear programme and degrade its military capabilities.

Israel's strategic missteps

While Israel's tactical gains project the image of a country determined to reshape West Asia through force, none of these advances has translated into long-term security. If the destruction of Hamas was one of the principal objectives of the war, two years on, Hamas has not been defeated, let alone destroyed. Israel may have decapitated the Hamas leadership and killed thousands of its fighters, but Hamas is not al-Qaeda or the Islamic State – transnational jihadist organisations detached from local populations and which have flourished through nihilistic violence.

Hamas is deeply rooted in Palestinian nationalism. Faced with military setbacks, Hamas has reinvented itself as an insurgency, its original avatar. This makes it extremely difficult for Israel to crush Hamas – ask the Americans about their 20 years in Afghanistan. If Israel sought to push the Palestine question back to the margins, its genocidal war in Gaza has had the opposite effect. Today, even Israel's closest partners have started formally recognising Palestinian statehood, while global public opinion is steadily turning against the Zionist state.

Regionally, Israel's strikes have incapacitated Iran's non-state allies and weakened its influence, but Hezbollah remains a formidable political and social force in Lebanon. And Iran did not merely survive Israel's 12 days of bombing (June 13-25, 2025). It hit back with long-range missiles. If Israel's desperation to weaken Iran took it to the 12-day war, its desperation to defeat Hamas took

it to bomb Qatar in September, which turned out to be a grave mistake. Israel targeted a gathering of Hamas's political leadership in Doha, but failed to kill any of the group's top leaders. Since October 7, Israel has bombed at least five countries besides Palestinian territories. It has targeted Syria, Lebanon, Yemen, Iran and Qatar. Qatar is a close American ally and its targeting shook the foundations of the U.S. security guarantees in the Arab world.

Israel's expansionism has pushed Arab countries to reassess their political and security calculus. If in September 2023, Saudi Arabia wanted to join the Abraham Accords and normalise ties with Israel, today an agreement with Tel Aviv is seen as a liability in the kingdom rather than as a strategic asset. Without a Saudi normalisation deal, the IMEEC is unlikely to take off. The I2U2 remains paralysed with the UAE making it clear that any Israeli attempt to annex the West Bank – a key demand of Israel's powerful far right – would cross a red line.

The Gulf monarchies have moved ahead diversifying or doubling down on their security partnerships – Saudi Arabia has signed a mutual defence agreement with nuclear-armed Pakistan, and Qatar has got a North Atlantic Treaty Organization (NATO)-style security assurance from Mr. Trump. His executive order states that future attacks against Qatar would be seen as a “threat to the peace and security of the U.S.”

No end plan

Despite its tactical military gains, Israel finds itself trapped in a strategic labyrinth. Like Mr. Trump put it, “Bibi [Netanyahu] took it very far in Gaza.” Israel still does not have an end plan. It cannot ignore the Palestine issue any more and continue the occupation without consequences. Isolated internationally, it is clinging to U.S. support for political, economic and military cover. Hamas remains an unresolved problem even after Israel's killing of at least 67,000 Palestinians in Gaza. The Iranian regime still stands with its nuclear programme. And the grand diplomatic vision of reshaping West Asia, with Israel at its centre, lies in ruins, as Arab states increasingly view Israel as a threat rather than a security provider. The return of Palestine to West Asia's geopolitical core would mean that Israel would have to make concessions to go back to the pre-October 7 diplomatic order. But Israel's leaders hate making concessions on Palestine. Mr. Netanyahu's only solution to these strategic challenges was to continue the war endlessly. But even that path is being shut after Mr. Trump publicly demanded Israel “to stop bombing Gaza immediately”.

Mr. Netanyahu wanted to reshape West Asia. The region is being remade, but not according to his design.

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Israel's tactical gains in a strategic labyrinth

Source: The Hindu, Page 6 (Editorial)

Paper: GS Paper 2 - International Relations | PSIR

Context:

The article analyses how Israel's military operations after the Hamas attack on 7th October 2023 have achieved short-term tactical gains but created a strategic deadlock in West Asia. It evaluates Israel's pre-attack geopolitical environment, its post-attack responses, and their regional consequences.

Geopolitical Conditions Before 7th October 2023:

1. **Relative stability: West Asia seemed calmer; the Palestinian question was marginalised.**
2. **Arab-Israeli normalisation: The Abraham Accords (2020) had brought Arab states like UAE and Bahrain closer to Israel.**
3. **U.S.-backed order: The U.S. sought to build a unipolar West Asia, led by Israel, integrating the region economically and strategically.**
4. **Iran isolated: Despite economic woes, Iran remained influential but largely contained through sanctions and regional opposition.**
5. **Arab monarchies' priorities: Focused on security and economic cooperation, not Palestinian resistance.**
6. **Palestinians divided: Hamas controlled Gaza; Fatah ruled the West Bank – no united front for Palestinian cause.**

Post 7th October 2023 - Israel's Tactical Gains:

1. **Hamas infrastructure weakened:** Israel severely damaged Hamas's military and administrative network.
2. **Loss of Hamas leadership:** Many of Hamas's senior leaders and fighters killed or captured.
3. **Gaza control expanded:** Israel reoccupied large areas, gaining buffer zones in northern Gaza and Rafah.
4. **Regional deterrence:** Hezbollah (Lebanon) and Iran-backed militias faced Israeli strikes, limiting their direct involvement.
5. **Diplomatic outreach:** Israel forged closer coordination with the U.S., to maintain legitimacy.
6. **Reinforced deterrence posture:** Showcased military power and reaffirmed Israel's security dominance in the region.

Strategic Missteps of Israel (Post-October 2023):

1. **No clear political plan:** Heavy militarism without a post-war vision for Gaza governance.
2. **Regional backlash:** Arab states criticised Israel's aggression, slowing peace efforts and Saudi-Israel normalisation.
3. **Humanitarian crisis:** Excessive civilian casualties eroded international moral legitimacy.
4. **Hamas not eliminated:** Despite heavy damage, Hamas retains symbolic and ideological resilience.
5. **Global image damage:** Israel's image as a democracy weakened due to indiscriminate bombings.
6. **Iran-Hezbollah axis revived:** Escalation united Israel's adversaries under anti-Israel rhetoric.
7. **Over-reliance on U.S.:** Israel's dependence on U.S. support exposed strategic vulnerability if U.S. priorities shift.



Waiting for other countries to unveil digital currency: RBI

Deputy Governor Rabi Sankar's remark comes at a time when FM emphasises the need for nations to prepare for adoption of stable coins

Ashokamithran T.
MUMBAI

The Reserve Bank of India (RBI) is waiting for other countries to launch digital currency and is in no hurry to roll out Central Bank Digital Currency (CBDC) nationwide for retail, said Deputy Governor Rabi Sankar.

"We're in no hurry because, you see, for this system to launch, you also have to have other countries launching it simultaneously," Mr. Sankar said on the sidelines of Global Fintech Fest on Tuesday. He said the most appropriate use-case for a CBDC was cross border payments, although he did not rule out a retail unveiling.

Use UPI with biometrics
Mr. Sankar's comments assume significance in light of Finance Minister Nirmala Sitharaman's recent observation that it was time



Making a point: The most appropriate use-case for a CBDC was cross border payments, Mr. Rabi Sankar said. ANI

for nations to prepare for adoption of stable coins.

The Global Fintech Fest saw the unveiling of biometric authentication for UPI payments by the National Payments Corporation of India (NPCI). The biometric authentication on-device can be used in place of the PIN that has been in use since UPI was launched in 2016.

Secretary to the Department of Financial Services at the Ministry of Finance M. Nagaraju unveiled the feature. The facility will be

made available to customers who choose to opt, giving them control over their preferred mode of authentication, the announcement said. "Each transaction is independently verified by the issuing bank using robust cryptographic checks, ensuring the highest level of safety while keeping the experience simple and seamless," the NPCI said.

The biometric system is expected to widely benefit senior citizens and first-time users.

"Waiting for other countries to unveil digital currency: RBI"

Source: The Hindu, Page 13

Section: Economy / GS Paper 3 - Indian Economy

Why in News:

RBI Deputy Governor Rabi Sankar stated that India is not in a hurry to roll out the Central Bank Digital Currency (CBDC) for retail use, and is waiting for other countries to launch similar systems. He said the best use-case for CBDC currently lies in cross-border transactions, though retail rollout is not ruled out.

What is CBDC (Central Bank Digital Currency):

- A digital form of sovereign currency issued and regulated by the Reserve Bank of India (RBI).
- It holds the same legal status as physical cash and is backed by the central bank.
- Objective: To provide secure, low-cost, and efficient digital payments and reduce dependence on cash.

CBDC for Retail Transactions (India's Status):

- Retail pilot already running in limited cities and banks.
- RBI not rushing nationwide rollout - awaiting global developments and interoperability frameworks.
- Retail CBDC can enable digital payments without bank intermediaries, ensuring privacy and financial inclusion.

About UPI and NPCI:

UPI (Unified Payments Interface):

- Launched in 2016 by the National Payments Corporation of India (NPCI).
- Enables instant, real-time money transfers between bank accounts using mobile devices.

NPCI:

- An umbrella organisation under RBI and IBA (Indian Banks' Association).
- Develops and manages retail payment and settlement systems like UPI, RuPay, BHIM, etc.

New Change - Biometric Authentication in UPI:

- Introduced by NPCI at the Global Fintech Fest (2025).
- Allows biometric verification on-device (fingerprint or facial recognition) instead of PIN entry.

- Each transaction is independently verified using robust cryptographic checks.
- Ensures higher security while keeping the experience simple and seamless.
- Expected to benefit senior citizens and first-time users.



CJI Gavai's calm demeanour is reminiscent of predecessor's presence of mind 57 years ago before a knife-wielding attacker

On March 13, 1968, then Chief Justice of India M. Hidayatullah wrestled a knife-wielding man in the court room to save his fellow judge Justice A.N. Grover's life. After a police officer cuffed the assailant, the CJI asked the officer not to manhandle the man.

