CENTRE FOR AMBITION
AN INSTITUTE FOR CIVIL SERVICES

IAS-PCS

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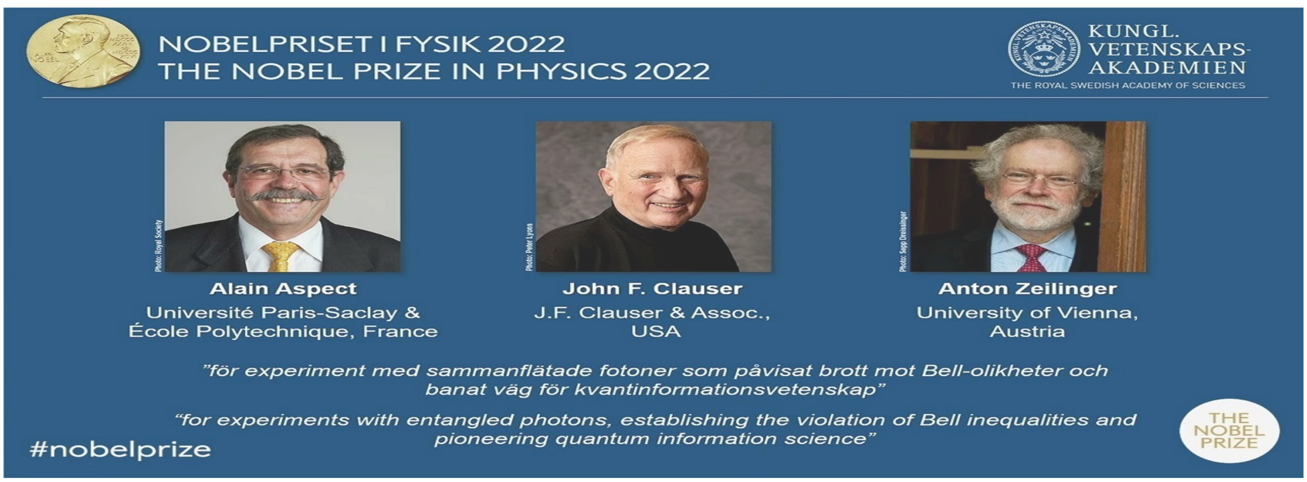
Nobel Prize in Physics 2025

Who Awards & Who Won

- The Nobel Prize in Physics is awarded by the **Royal Swedish Academy of Sciences**, as per Alfred Nobel's will.
- **John Clarke (USA), Michel H. Devoret (USA), and John M. Martinis (USA)** were jointly awarded the 2025 prize.



Why It Was Awarded

- Their work demonstrated **macroscopic quantum mechanical tunneling** and **energy quantisation** in an **electrical circuit** — showing that quantum phenomena normally seen in atoms can be made to manifest in larger, measurable systems.
- They used a **superconducting circuit with Josephson junctions** to show that the circuit could tunnel from a zero-voltage state (a "barrier") and absorb or emit energy in discrete quanta, as predicted by quantum mechanics.

Key Highlights

1. **Crossing the Microscopic Boundary:** They proved that quantum weirdness isn't confined to atoms — under the right conditions, it can appear in circuits you can hold in your hand.
2. **Tunneling at Macroscale:** Their circuit could "tunnel" through a barrier — a phenomenon normally seen at subatomic scales — now made observable in a larger system.

3. **Quantised Energy in Circuit:** The electrical circuit could absorb or emit energy in fixed amounts (quanta), again mirroring behavior predicted by quantum mechanics for atoms.

Implications & Significance

- **Quantum Technology Foundation:** Their experiments lay groundwork for **quantum computers, quantum sensors, and quantum cryptography**.
- **Bridging Theory & Real Systems:** They bring abstract quantum phenomena into physically usable systems, helping to bridge theoretical physics and practical engineering.
- **Pushing Limits:** Their work raises deeper questions about **how large a system can show quantum behavior**, a frontier in physics

Afghanistan at the Crossroads:
Historical Turmoil, Great Power Rivalry, and India's Strategic Response

- **Afghanistan's geography** — a land bridge linking **South Asia, Central Asia, the Middle East, and China**, has made it a strategic pivot for great powers throughout history.
- It has often been called the **"Heart of Asia"** and the **"graveyard of empires."**
- Its rugged terrain and tribal social fabric have made central control difficult, and external interference has repeatedly reshaped its political and security landscape.

The Cold War Phase (1979–1989): Soviet Invasion and U.S. Response

- In **1979**, the **Soviet Union invaded Afghanistan** to support the pro-communist regime in Kabul.
- The **U.S. and Pakistan**, through the CIA and ISI, trained and armed **Mujahideen fighters** in a covert operation known as **Operation Cyclone**.
- The war devastated Afghanistan and radicalized the region, giving rise to **extremist networks** that would later evolve into the **Taliban and Al-Qaeda**.

Civil War and Rise of the Taliban (1989–2001)

- The Soviet withdrawal in **1989** left a power vacuum. The communist regime collapsed in 1992, leading to civil war among rival factions.
- The **Taliban**, a movement emerging from Afghan refugee madrasas in Pakistan, seized power in **1996**, enforcing a harsh interpretation of Islamic law.
- The regime provided sanctuary to **Osama bin Laden** and Al-Qaeda.
- India opposed the Taliban government and supported the **Northern Alliance**, along with Russia and Iran, while Pakistan was the Taliban's chief backer.

U.S. Invasion and the Post-2001 Order

- After the **9/11 attacks (2001)**, the U.S. invaded Afghanistan under **Operation Enduring Freedom**, toppling the Taliban regime and installing a democratic government under **Hamid Karzai**.
- India strongly supported this new government, reopening its embassy, and becoming one of **Afghanistan's largest regional donors** with over **$3 billion** in developmental aid.
- India built key infrastructure — **Salma Dam (Herat)**, **Afghan Parliament Building (Kabul)**, **Zaranj-Delaram Highway**, and power transmission lines — enhancing both goodwill and strategic access.

U.S. Withdrawal and Taliban's Return (2021-Present)

- In **February 2020**, the **Doha Agreement** between the U.S. and Taliban paved the way for U.S. withdrawal, bypassing the Afghan government.
- By **August 2021**, the Taliban captured Kabul, ending two decades of U.S. presence.

India's Engagement with Afghanistan (Post-2021 Taliban Takeover)

- India maintained **non-recognition but pragmatic engagement**, focusing on humanitarian assistance, limited diplomatic re-engagement, and participation in regional dialogues such as the **Moscow Format** and **Heart of Asia** process.
- India reopened its embassy in Kabul in 2022 for humanitarian coordination and continues to supply **wheat, vaccines, and medicines** to the Afghan people.

Recent Developments (2025)

1. India's Opposition to U.S. Militarization

- At the **Moscow Format Consultations (October 2025)**, India joined regional powers **Russia, China, Iran, Pakistan, and Central Asian states** in **opposing any re-deployment of U.S. military infrastructure in Afghanistan**, particularly the reported American interest in reclaiming the **Bagram Air Base**.
- The joint statement called any such attempt **"unacceptable"** and contrary to **regional peace and stability**.The move underscores India's support for **Afghanistan's sovereignty** and preference for **regional security solutions** rather than external militarization.

2. High-Level Taliban Visit to India

- Earlier this month, **Afghan Foreign Minister Amir Khan Muttaqi** was permitted by the UN Security Council to travel to India marking the **first high-level contact between India and the Taliban regime since 2021**.

- India's willingness to engage, even cautiously, signals a shift from isolation to **calibrated diplomatic pragmatism**.This approach allows India to maintain influence and safeguard its developmental and security interests, even without formal recognition of the Taliban government.
- India has cautiously re-engaged with the Taliban, sending humanitarian aid and participating in **Moscow Format** consultations.
- The **recent opposition** to **U.S. militarization** (e.g., reclaiming **Bagram Air Base**) demonstrates India's preference for **regional stability led by Asian powers** rather than external intervention.
- This marks a significant evolution: from opposing the Taliban (1990s) → partnering with U.S.-backed governments (2001-2021) → now engaging pragmatically with the Taliban regime for strategic reasons.

Significance of India's Stance

1. **Strategic Autonomy and Independent Foreign Policy:** demonstrates India's commitment to an autonomous regional stance rather than aligning with any power bloc.
2. **Countering Pakistan's Influence:** A peaceful and neutral Afghanistan limits Pakistan's "strategic depth" and curtails cross-border terrorism that destabilizes India's security environment.
3. **Geopolitical Balance:** Engaging with Afghanistan while aligning with regional platforms helps India counter both **Pakistan's influence** and **China's growing foothold in the region**.
4. **Regional Cooperation and Connectivity:** strengthens platforms like the **Moscow Format** and complements its connectivity ambitions via **Chabahar Port** and the **International North-South Transport Corridor (INSTC)**.
5. **Preserving Goodwill and Soft Power**

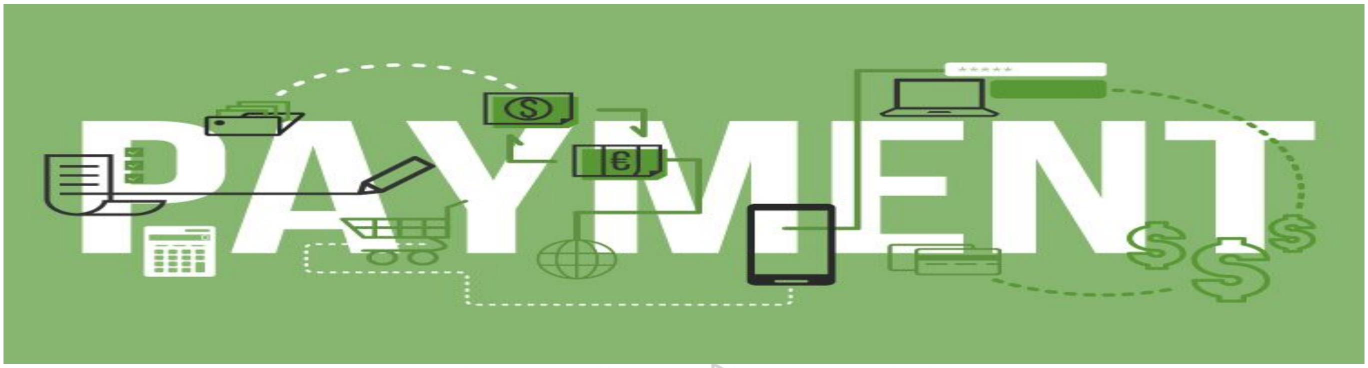
Challenges Ahead

- **No Formal Recognition:** Engaging the Taliban without legitimizing their regime is a diplomatic tightrope.
- **Security Risks:** Presence of terrorist networks, drug trade, and instability at borders.
- **Great Power Rivalry:** Navigating between the U.S., Russia, China, and Iran — all of whom have competing stakes in Afghanistan.
- **Human Rights & Values:** Balancing realpolitik with concerns over women's rights, education, and inclusivity in Taliban governance.

India's evolving Afghanistan policy represents **strategic realism blended with principled restraint**. By supporting regional consensus against militarization and cautiously engaging the Taliban regime, India aims to safeguard its interests while promoting regional peace.

Payment Settlement Systems in India

- A **Payment and Settlement System (PSS)** facilitates the **transfer of funds and securities** between individuals, businesses, and banks, ensuring **speed, safety, and finality** in transactions.
- India's PSS has evolved from **bank-only systems** to **digital, interoperable platforms**, driven by **regulatory reforms and technological innovation** payers and beneficiaries.



Legal and Regulatory Framework

a) Payment and Settlement Systems Act, 2007 (PSS Act)

- **Section 4:** "No person other than the RBI can commence or operate a payment system in India unless authorised by RBI."
  * Even banks require **specific RBI permission** to operate a payment system. Operating a **banking function** and operating a **payment system** are legally distinct.

b) Reserve Bank of India (RBI)

- **Primary regulator of payment and settlement systems in India under the** Payment and Settlement
- Systems Act, 2007 (PSS Act).

Functions:

- Licensing payment system providers.
- Setting rules for security, settlement, interoperability, and efficiency.
- Oversight of settlement mechanisms to ensure systemic stability.

Payment System Operators in India

- RBI has authorised various types of **payment system operators**, including banks and non-banks:

Type	Examples
Financial Market Infrastructure	Clearing Corporation of India
Retail Payment Systems	National Payments Corporation of India (NPCI)
Card Payment Network	Mastercard, VISA
Prepaid Instruments	Amazon Pay
Cross-Border Money Transfer	UAE Exchange Centre

*Non-banks now **cooperate with and compete against banks**, either as **technology providers** or by **directly offering retail electronic payments**.

Types of Payment and Settlement Systems

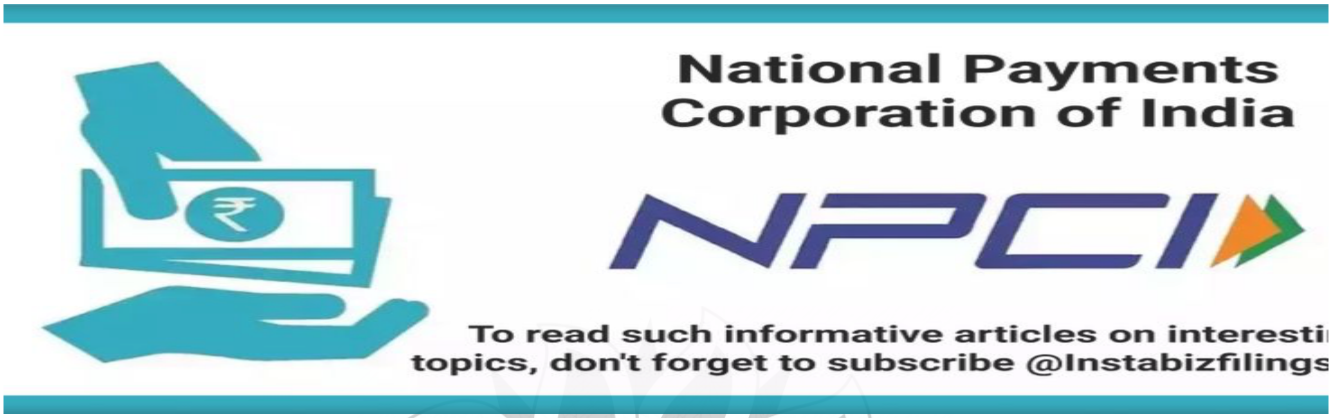
a) Large-Value Payment Systems (LVPS)

- Used for **high-value and time-critical transactions** between banks. Eg. **RTGS (Real Time Gross Settlement)**.

b) Retail Payment Systems

- For **small-value, high-volume transactions** among individuals and businesses. Eg.**NEFT (National Electronic Funds Transfer)**; **IMPS (Immediate Payment Service); UPI (Unified Payments Interface) etc.**

National Payments Corporation of India(NPCI) :



- NPCI is a non-bank payment system operator authorized by the RBI under PSS act, 2007.
- Constituted as a **Not-for-Profit company**, with **51% owned by public sector banks**. Develops and manages retail payment systems, ensures **interoperability**, and supports **financial inclusion**.

NPCI-Operated Systems

- **National Financial Switch (NFS):** ATM network integration.
- **Immediate Payment Service (IMPS):** 24×7 instant interbank transfers.
- **Unified Payments Interface (UPI):** instant interbank transfers
- **Aadhaar Enabled Payment System (AePS):** Bank transactions via Aadhaar authentication.
- **RuPay Cards:** Domestic card network.
- **National Automated Clearing House (NACH/ACH):** Bulk electronic credit/debit transactions.
- **National Electronic Toll Collection (FASTag):** Automated toll payments using vehicle identification.

Unified Payments Interface (UPI)

- **Launched:** April 2016 by NPCI.
- **Purpose:** Enables **instant, 24×7 fund transfer between bank accounts** using a mobile app. Uses a Virtual Payment Address (VPA) instead of bank account details.

Types of UPI Services

1. **P2P (Peer-to-Peer) Payments**: Transfer money between individuals instantly using **VPA, mobile number, or Aadhaar**.
2. **P2M (Peer-to-Merchant) Payments**: Pay merchants via **QR codes, apps, or POS terminals** for goods and services.
3. **UPI Lite**: Low-value, offline transactions. **works with minimal internet**.
4. **Recurring Payments / AutoPay**: Pre-authorized, scheduled payments for **subscriptions and bills**.
5. **Merchant Micro/Macropayments**: Business payments to suppliers or bulk settlements via **UPI-enabled portals**.

6. **Cross-Border UPI (UPI Global)**: Make or receive **international payments** via RBI-approved partner banks.
7. **UPI 123PAY**: Enables **feature phone users** to access UPI via **voice commands, IVR, or USSD**, without a smartphone or internet.

Recent NPCI Innovation: Biometric and Wearable Glass Authentication for UPI

- Launched in **October 2025 at the Global Fintech Fest.** Objective is to m**ake UPI** more secure, inclusive, and convenient**.**

Key Features

1. **On-Device Biometric Authentication:** Fingerprint or facial recognition on user devices. Eliminates PIN entry; transaction verified using secure cryptography.
2. **Aadhaar-Based Face Authentication:** Simplifies UPI PIN setup and reset using Aadhaar facial recognition.
3. **Wearable Smart Glasses:** Hands-free UPI Lite payments via voice commands. Useful for people with disabilities or in situations needing one-handed operation.

Significance

- **Enhanced Security:** Reduces PIN-related fraud and protects sensitive data on the device.
- **Improved Accessibility:** Benefits differently-abled individuals.
- **Streamlined UX:** Faster and user-friendly digital transactions.
- **Supports Digital India and Financial Inclusion Goals:** Encourages adoption of UPI across age groups and demographics.