

BRAIN-COMPUTER INTERFACE (BCI)



- A **Brain-Computer Interface (BCI)** is a system that enables **direct communication between the brain and an external device**, such as a **computer or robotic limb**.

- It **decodes brain signals** and translates them into commands to **control machines, bypass damaged neural pathways**, and restore lost functions in persons with **neurological disorders**.
- Earlier BCI systems could only **translate brain signals into text**, and that too with **limited vocabulary, slow processing speed**, and **reduced accuracy**.

How Does It Work?

- **Sensor implantation:** Electrodes were surgically placed on the **motor cortex** (brain region controlling movement).
- **Signal interpretation:** The system decodes **neural signals of imagined movement**, using **machine learning** to predict changes over time in signal patterns.
- **Virtual training:** The user was first trained using a **virtual robotic arm**, allowing refinement of mental control.
- **Real-world application:** The participant performed complex tasks like **picking up blocks, opening a cabinet, and holding a cup under a water dispenser**, indicating **precise, consistent control**.

Broader Applications of BCI Technology

- The BCI also has potential for **restoring speech** in individuals with conditions like **brainstem stroke** or **Amyotrophic Lateral Sclerosis (ALS)**.
- Fine electrodes and artificial neural networks can decode intended speech and generate **text output, Audible speech**, and a **speaking avatar**.

One study showed a patient with ALS communicating at **62 words per minute**, 3.4 times faster than previous BCI systems.

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NATIONAL ARCHIVES OF INDIA (NAI)



- The NAI, which functions under the **Ministry of Culture**, is the **repository of all non-current government records**, holding them for the use of administrators and scholars.

- It is the custodian of the **records of enduring value of the Government of India**.
- It is the **biggest archival repository in South Asia**.

History:

- It was **originally established as the Imperial Record Department** on **11 March 1891 in Kolkata (Calcutta)**.
- It was **transferred to New Delhi in 1911**.
- The complete transfer of records from Calcutta to New Delhi was finalized in **1937**.
- The NAI also serves as the **nodal agency for implementing the Public Records Act, 1993, and the Public Record Rules, 1997**.
- Currently, the National Archives of India holds over 34 crore pages of Public Records, including **files, volumes, maps, treaties, rare manuscripts, cartographic records, parliamentary debates, censuses, travel accounts, proscribed literature, and government gazettes**.
- A significant portion of its oriental records is in Sanskrit, Persian, Odia, and other languages.
- **Access to the records in the NAI is governed by the provisions of the Public Records Rules, 1997**.
- The NAI keeps and conserves records of the government of India and its organisations. **It does not receive classified documents**.
- It has one **regional office at Bhopal** and three Records Centers at Bhubaneswar, Jaipur, and Puducherry.

Abhilekh PATAL:

- The Abhilekh PATAL (Portal for Access to Archives and Learning) is an initiative of NAI to make its rich treasure of Indian archival records available to all online.
- It is a full-featured web portal to access the NIA's reference media and its digitized collections through the internet.
- It contains more than 2.7 million files held by the National Archives of India. The Digitized Collections contains over 71,792 digitized records for online access.

WHAT IS THE SPECIAL 301 REPORT?



- It is an annual report by the United States Trade Representative (USTR) under the Trade Act of 1974.
- It identifies countries that are considered by the US as not providing adequate and effective protection of Intellectual Property Rights (IPRs) or fair and equitable market access to IP rights holders from the US.
- The report has been issued every year since 1989.
- It designates countries as “priority foreign country”, “priority watch country”, and “watch list country”.
- Designation as a priority foreign country initiates an investigation and possible application of sanctions on the foreign country, while designation on a Priority Watchlist suggests serious IPR deficiencies that require greater US attention.
- Other countries that are considered to have serious IPR deficiencies but are not designated for greater US attention are placed on a Watchlist.
- The report includes both developed and developing countries.

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SC UPHOLDS USE OF SPYWARE, SAYS NATIONAL SECURITY PARAMOUNT IN PEGASUS CASE

- Spyware is a type of malicious software (malware) designed to secretly gather data from a user's device and transmit it to third parties without consent.
- It is often used for financial gain by advertisers, data brokers, or cybercriminals.

Purpose and Risks

- Spyware collects sensitive information like browsing history, financial details, and login credentials.
- It poses serious threats by:
 - Enabling identity theft and financial fraud
 - Slowing device and network performance
 - Causing data breaches in businesses
 - Installing additional malicious software
- **Common Types of Spyware**
 - **Adware** – Monitors activity to serve or sell targeted ads.
 - **Infostealer** – Gathers specific data and chat logs.
 - **Keyloggers** – Records every keystroke to steal usernames, passwords, and messages.
 - **Rootkits** – Grants deep access to a system, often undetectable.
 - **Red Shell** – Tracks user activity during PC game installations.
 - **System Monitors** – Captures emails, websites visited, and keystrokes.
 - **Tracking Cookies** – Follows user behavior across the web.
 - **Trojan Horse Virus** – Delivers spyware by disguising as legitimate software.
- **How Spyware Works: The 3-Step Process**
 - Infiltration – Installed via apps, malicious websites, or attachments.
 - Monitoring and Data Capture – Tracks browsing, captures keystrokes, and takes screenshots.

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- Transmission or Sale – Sends stolen data to attackers or sells it on the dark web.

SC Emphasizes National Security Over Disclosure

- The Supreme Court stated that national security cannot be compromised, and there is nothing wrong with a country possessing or using spyware for security purposes.
- The bench, led by Justice Surya Kant and Justice N Kotiswar Singh, clarified that the key concern is not ownership of spyware but against whom it is deployed.
- **Individual Right to Privacy Recognised**
 - While declining to make the full report public, the Court acknowledged that individuals have a **Constitutionally protected right to privacy**.
 - It stated that people who suspect their phones were hacked deserve to know the truth, and the court would consider informing them individually.
- **Petitions Alleging Government Surveillance**
 - The case stems from petitions filed in 2021 by journalists, activists, and public figures.
 - They alleged that the government used **Pegasus spyware**, a military-grade surveillance tool made by Israel's NSO Group, to monitor citizens.
 - Petitioners argued that the core issue remains whether the government possesses and has used Pegasus.
 - They stressed that ownership implies the potential for continued surveillance.

INDUCTION OF 26 NEW RAFALE M AIRCRAFT

India and France have signed a government-to-government deal worth \$7.4 billion (around ₹63,000 crore) for 26 Rafale Marine fighter jets for the Indian Navy.

Earlier, 36 Rafale jets were inducted into the Indian Air Force starting in 2021.

Naval Aviation: An Overview

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- Naval aviation refers to the use of military aircraft by naval forces, operating from aircraft carriers, helicopter-equipped ships, or land bases to support maritime operations.
- **Specialised Aircraft and Operations**
 - Naval aviation includes aircraft designed for:
 - Short takeoffs and arrested landings on carriers
 - Air-to-air combat and surface/submarine attacks
 - Maritime reconnaissance and search & rescue
 - Logistics and supply missions
- **Key Roles of Naval Aviation**
 - **Fleet Air Defence:** Protects naval forces beyond the range of land-based air cover.
 - **Strategic Power Projection:** Projects air power globally without relying on land bases.
 - **Anti-Surface Warfare:** Targets enemy ships with air-launched weaponry.
 - **Support for Amphibious Warfare:** Assists in marine landings and inland operations.
 - **Mine Countermeasures:** Detects and neutralizes enemy sea mines using aerial assets.
- **Key Aircraft Carriers in India**
 - **INS Vikrant (1961-1997):** India's first aircraft carrier, operational for several decades.
 - **INS Viraat (1987-2017):** Served the Indian Navy for 30 years after being commissioned in 1987.
 - **INS Vikramaditya (Since 2013):** A Russian-origin carrier, currently in service with the Indian Navy.
 - **INS Vikrant (Commissioned in 2022):** India's first indigenously built aircraft carrier, joining the fleet in 2022.

NEW APPROACH FOR GREEN HYDROGEN PRODUCTION



Researchers at the Institute of Nano Science and Technology (INST), Mohali, have developed new insights into proton adsorption on catalyst surfaces, paving the way for more efficient green hydrogen production.

- A novel heterostructure, combining Copper Tungsten Oxide (CuWO_4) and Copper Oxide (CuO), has been created to exploit the **Built-In Electric Field (BIEF)** effect for enhanced hydrogen evolution.
- The structure is formed by growing CuWO_4 nanoparticles over a $\text{Cu}(\text{OH})_2$ precursor, leading to a **p-n heterojunction** that creates an **asymmetric electronic environment**.
- This **BIEF** plays a crucial role in **modulating proton adsorption and desorption**, directly influencing the **Hydrogen Evolution Reaction (HER)**

What is Green Hydrogen?

- **Green Hydrogen** is produced through the **electrolysis of water** using **renewable energy** sources like **solar, wind, or hydropower**, releasing **no greenhouse gases**.
- It is a **clean, sustainable, and flexible energy carrier**, with **water vapour** as its only by-product.
- Unlike **grey hydrogen** (from fossil fuels), green hydrogen contributes to **zero carbon emissions**.

Green Hydrogen Production Methods

- **Alkaline Electrolysis:** Mature, low-cost method using **KOH/NaOH**; needs **nickel/platinum**
- **Proton Exchange Membrane (PEM) Electrolysis:** High efficiency, fast, but expensive due to **precious metal catalysts**.
- **Solid Oxide Electrolysis (SOEC):** Works at **700–1000°C**, enables **co-electrolysis of H_2O and CO_2** , but involves **complex materials and high costs**.

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WAM! AND WAVES 2025



• **WAM! (WAVES Anime & Manga Contest)** is India's first national initiative focused on discovering, nurturing, and promoting original Indian Intellectual Properties (IPs) in anime, manga, webtoons, and cosplay.

- It is being organised by the **Ministry of Information and Broadcasting** in collaboration with the **Media & Entertainment Association of India (MEAI)**.
- The initiative will culminate in the **WAVES 2025 national finale**, which will be held from **May 1–4, 2025** at the Jio World Convention Centre, Mumbai.

About WAVES 2025

- **WAVES (World Audio-Visual & Entertainment Summit) 2025** is a pioneering event designed to promote India's strength in the **AVGC-XR** sector — **Animation, Visual Effects, Gaming, Comics, and Extended Reality**.
- WAVES is being hosted under the central theme: **“Create in India, Create for the World”**, emphasizing India's ambition to become a **global creative hub**.
- The summit brings together **global leaders, innovators, studios, and creators**, providing a **collaborative platform** for India's **media and entertainment economy**.
- WAVES features the **Create in India Challenges (CIC)** — an initiative that received **over 1 lakh registrations**, including **1,100 international participants**, reflecting **global interest** in India's creative ecosystem.
- The summit includes discussions and showcases on **Broadcasting, Films, Print Media, Radio, Digital Media, Advertising, Social Media Platforms, and Generative AI**.
- It also highlights technological advancements in **Augmented Reality (AR), Virtual Reality (VR), and Extended Reality (XR)**.

WHAT IS RABIES?



- It is a deadly **zoonotic disease** caused by the **Rabies virus (RABV)** that **attacks the nervous system**.
- RABV is an **RNA virus** of the rhabdovirus family that can affect the body in one of two ways.
 - It can enter the peripheral nervous system directly and migrate to the brain.
 - **Once inside the nervous system**, the virus produces **acute inflammation of the brain**.
- **Transmission:**
 - The virus **spreads through the saliva of infected animals**.
 - **Infected animals** can **spread the virus by biting** another animal or a person.
 - In rare cases, rabies can be spread when infected saliva gets into an open wound or the mucous membranes, such as the mouth or eyes.
 - In up to **99% of the human rabies cases**, **dogs are responsible** for virus transmission.
- **Symptoms:**
 - **Initial symptoms** of rabies include generic signs like **fever, pain, and unusual** or unexplained **tingling, pricking, or burning sensations** at the wound site.
- **Prevention:**
 - It is a **vaccine-preventable disease**.
 - **Vaccinating dogs**, including puppies, is the **most cost-effective strategy** for preventing rabies in people because it stops the transmission at its source.