

1. Nobel Prize in Physics 2023: Scientists made it possible to watch movement of electrons

Introduction

In the world of atomic and subatomic particles, things happen incredibly fast, much faster than the blink of an eye. However, thanks to groundbreaking work by Nobel laureates, scientists can now capture and study these ultra-fast processes using attosecond pulses of light. This article simplifies their Nobel Prize-winning achievement.

Capturing fast events

In our everyday lives, we use cameras with high shutter-speeds to capture fast events, like a bullet hitting an apple. But at the atomic level, things happen even faster, in picoseconds (one trillionth of a second or 1×10^{-12} of a second) and femtoseconds (thousand times smaller than picoseconds or 1×10^{-15} of a second). For a long time, scientists thought femtoseconds were the limit for capturing these rapid events.

Why femtoseconds was considered limit

Light pulses, the only plausible tool to capture processes at the atomic level, cannot be made indefinitely shorter. Light consists of waves, or vibrations in the electromagnetic field. The shortest possible pulse would have to be at least one cycle long, equivalent to its wavelength. For all sorts of light produced by laser systems, this cycle used to take at least a few femtoseconds to complete. This was longer than the sub-atomic motion that was happening in a matter of attoseconds. Scientists were therefore unable to glimpse the motion of electrons with existing technologies.

Electrons move in Attoseconds

Processes occurring within a few attoseconds (1×10^{-18} of a second or one quintillionth of a second), such as the movement of electrons within an atom, were previously beyond our observational capabilities. Attosecond pulses of light were needed to catch these ultra-fast actions.

Nobel Prize Winners

Pierre Agostini (from France), Ferenc Krausz (from Hungary), and Anne L'Huillier (from France) received the 2023 Nobel Prize in Physics for their pioneering work in generating attosecond pulses of light. Anne L'Huillier became the fifth woman to win the Physics Nobel.

Logic behind observing processes occurring in Attoseconds

To observe a process, measurements must happen faster than the process itself. Light pulses, being the tool for atomic-level observations, had their limits. However, the Nobel laureates found innovative ways, like combining different wavelengths of light, to create attosecond pulses, enabling the observation of previously hidden phenomena.

Potential applications

Scientists not only want to observe these ultra-fast events but also control them. The ability to tweak intermediate steps in processes opens doors for achieving desired outcomes in various fields.

Attosecond science has vast potential, spanning across electronics, medicine, and multiple scientific disciplines. It could have applications in cancer therapy and various other areas of research.

Relevance: GS Prelims & Mains Paper III; Science & Technology

Source: The Indian Express and The Hindu

2. UAPA Sections Invoked Against NewsClick: Delhi Police's Allegations

Allegations against NewsClick

The Delhi Police has taken action against news portal NewsClick, claiming that it received funds for promoting pro-China content. The police have filed an FIR against NewsClick under the Unlawful Activities (Prevention) Act (UAPA), a stringent anti-terror law. The UAPA sections invoked in the case include Section 16, which deals with punishment for terrorist acts.

Other UAPA Provisions Invoked

Apart from Section 16, the FIR also invokes several other sections of the UAPA, including Section 13 (unlawful activities), Section 17 (raising funds for terrorist acts), Section 18 (conspiracy), and Section 22 (C) (offences by companies and trusts). Additionally, IPC sections 153 A (promoting enmity between different groups) and 120B (criminal conspiracy) have been applied.

This action against NewsClick raises concerns about freedom of the press and the use of stringent anti-terror laws in such cases.

Definition of "Terrorist Act"

Section 15 of the UAPA defines a "terrorist act" and prescribes a minimum punishment of five years in prison up to a life sentence. In cases where the act results in death, the penalty can be the death penalty or life imprisonment. This section pertains to violent and serious acts that threaten India's unity, integrity, security, sovereignty, or economic stability.

Scope of "Terrorist Act"

The provision covers acts such as using explosives, causing death or damage to property, disrupting essential community services, and damaging India's monetary stability through counterfeit currency.

UAPA Framework

The UAPA operates under a different framework compared to the Indian Penal Code (IPC). It grants the state more authority by extending timelines for filing chargesheets and imposing strict conditions for bail.

Bail Provisions Under UAPA

To deny bail under the UAPA, the court must establish a "prima facie" case against the accused. The Supreme Court has defined "prima facie" as not delving into evidence or circumstances but considering the overall case presented by the state.

Section 43D(5) of the UAPA states that a person accused of an offense punishable under Chapters IV and VI of the Act cannot be released on bail or their own bond while in custody unless the Public Prosecutor has been given a chance to be heard. The court may deny bail if it believes there are reasonable grounds to believe the accusation is prima facie true.

Relevance: GS Prelims & Mains Paper II; Governance

Source: The Indian Express and The Hindu

3. Google's Chromebook Production in India: Significance and Impact

Google's Manufacturing Partnership

Google has initiated the production of its Chromebook laptops in India in collaboration with HP, laptop manufacturer. This development marks a significant step in India's efforts to strengthen its electronics manufacturing sector.

Global Supply Chain Diversification

Amidst worldwide geopolitical uncertainties, prominent companies are seeking to diversify their supply chains. Google's move to manufacture Chromebooks in India is part of this trend, positioning India as an alternative manufacturing hub to China.

Closure of PLI Scheme and Import Challenges

India recently closed applications for its Rs 17,000 crore production linked incentive (PLI) scheme for IT hardware, including laptops and servers. The country has also taken steps to reduce imports from China, particularly in the IT hardware sector.

Production Location and Purpose

The Chromebook laptops will be manufactured at HP's Flex facility near Chennai, which has been producing laptops and desktops since August 2020. Production began on October 2, with a focus on meeting the demand for affordable PCs, primarily in the education sector.

Competing with Windows

While Chromebooks are widely used in educational institutions worldwide, they have yet to gain significant popularity in India, where Windows-based laptops dominate. Google's move aims to strengthen its competition with Windows computers from companies like Dell, Lenovo, and Asus.

Impact on Imports

India has witnessed a surge in imports of electronic goods and laptops in recent years, with a significant share coming from China. The government's production-linked incentive (PLI) scheme attracted over 40 companies, including major players like Dell, HP, Asus, Acer, and Lenovo.

Import Management System

To reduce import dependence on China, India has introduced an 'import management system' requiring companies to register and disclose import-related data. Eventually, companies will need to source from "trusted sources" as per government guidelines.

Relevance: GS Prelims & Mains Paper III; Economics

Source: Indian Express

4. \$600 million India-Japan Fund

About India-Japan Fund

The National Investment and Infrastructure Fund (NIIF) has entered into a collaboration with the Japan Bank for International Cooperation (JBIC) to launch a \$600 million India-Japan Fund (IJF) with JBIC and Government of India (GoI) as anchor investors.

This is the NIIF's first bi-lateral fund, with the GoI contributing 49% of the target corpus and the remaining 51% contributed by JBIC. The Fund will be managed by NIIF Limited (NIIFL). JBIC IG (a subsidiary of JBIC) will support NIIFL in promoting Japanese investments in India.

Use of fund

India Japan Fund will focus on investing in environmental sustainability and low carbon emission strategies.

National Infrastructure and Investment Fund (NIIF)

The National Infrastructure and Investment Fund (NIIF) is a vital financial institution in India established to promote and facilitate investments in the country's infrastructure sector. It plays a crucial role in bolstering India's economic growth and development.

Creation of NIIF: The Indian government founded NIIF in 2015 as a dedicated fund for investing in infrastructure and related projects. It was set up to catalyze both domestic and foreign investments in various infrastructure sectors.

Objectives of NIIF: NIIF's primary objectives include:

Financing Infrastructure: NIIF aims to provide long-term capital to infrastructure projects across various sectors, such as transportation, energy, urban development, and more.

Promoting Investment: It encourages both domestic and foreign investments in India's infrastructure sector, thereby contributing to economic growth.

Asset Management: NIIF engages in the management of infrastructure assets, aiming to generate attractive returns for its investors.

Relevance: GS Prelims & Mains Paper II; Bilateral Relations

Source: PIB