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1. India and UAE Sign Historic Civil Nuclear Cooperation Agreement

Introduction



Crown Prince of Abu Dhabi, to India.

In a landmark move, India and the United Arab Emirates (UAE) have signed their first-ever memorandum of understanding (MoU) for civil nuclear cooperation. The deal, between India's Nuclear Power Corporation of India Ltd. (NPCIL) and the UAE's Emirates Nuclear Energy Company (ENEC), was signed during the visit of Sheikh Khaled bin Mohamed bin Zayed Al Nahyan, the

Background of Cooperation

The foundation for this agreement was laid during Prime Minister Narendra Modi's visit to the UAE in August 2015, where both nations committed to cooperating in the peaceful use of nuclear energy. The areas of collaboration include safety, health, agriculture, and science and technology. Diplomatic sources highlight that this agreement is unprecedented in the history of nuclear cooperation between the two nations.

Trilateral Cooperation with France

The MoU is a result of long-standing discussions between India and the UAE. In September 2022, the foreign ministers of France, India, and the UAE launched a trilateral cooperation format during a meeting at the UN General Assembly in New York. This was followed by a three-party phone call in February 2023, where all parties agreed to promote cooperation in the fields of solar and nuclear energy.

Other Key Agreements

In addition to the nuclear cooperation MoU, the two sides signed several other important agreements during the Crown Prince's visit:

1. LNG Supply MoU: A long-term LNG supply agreement was signed between Abu Dhabi National Oil Company (ADNOC) and Indian Oil Corporation Ltd.

2. Production Concession Agreement: ADNOC and Urja Bharat signed a Production Concession Agreement for Abu Dhabi Onshore Block 1.

3. Food Parks Development: The Government of Gujarat and Abu Dhabi Developmental Holding Company PJSC (ADQ) inked a deal for the development of food parks in India.

Strategic Alliances

India and the UAE are part of the I2U2 grouping, which also includes Israel and the United States. The Crown Prince's visit coincided with the first India-Gulf Cooperation Council meeting, which took place in Saudi Arabia.

Relevance: GS Prelims; Bilateral Relations

Source: The Hindu

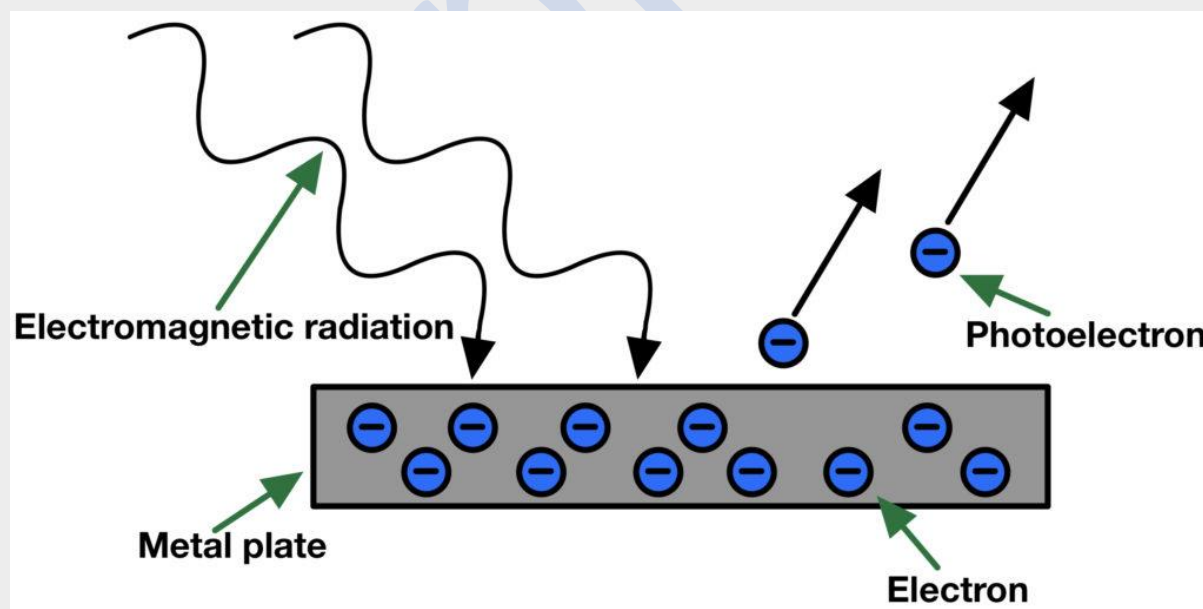
2. Superfast Studies of the Photoelectric Effect: A Step Towards Unveiling Matter's Secrets

Introduction

Albert Einstein's explanation of the photoelectric effect, which earned him a Nobel Prize, was a groundbreaking discovery that revealed how light can eject electrons from a material when it possesses sufficient energy. This phenomenon, fundamental to solar power technology, is now being studied on ultrafast timescales, leading to new insights into the nature of matter.

Understanding the Photoelectric Effect

In the early 20th century, physicists noticed that metals emit electrons when irradiated with light. Einstein proposed that light consists of particles called photons, which can knock electrons out of a metal if they possess enough energy. This explanation was a turning point for both quantum theory and technology, including solar cells, which convert sunlight into electricity.



Advances in Ultrafast Light Pulses

Recent advancements in ultrashort light pulses have allowed physicists to study the photoelectric effect at unprecedented speeds. In 2023, researchers who contributed to the development of attosecond pulses (one attosecond is 10^{-18} seconds) won the Nobel Prize in Physics. These pulses help capture short-lived atomic events, revealing details about electron behavior.

Photoionisation Delay: New Insights into Matter

One focus of these studies is photoionisation delay, which measures the time it takes for an electron to be ejected from a material. This delay offers critical information about the electronic structure of matter. For instance, a 2010 study led by Nobel laureate Ferenc Krausz discovered a 20-attosecond delay between two electrons leaving close energy levels in a neon atom.

Recent Discoveries in Nitric Oxide Molecules

In 2023, researchers from SLAC National Accelerator Laboratory reported a significant photoemission delay in nitric oxide (NO) molecules. They found that core electrons from oxygen atoms were emitted up to 700 attoseconds after those from nitrogen atoms. This unexpected delay was linked to several factors, including the shape resonance effect, where an electron gets temporarily trapped due to the molecule's potential energy.

Applications and Future Implications

These studies are not just theoretical; they have practical applications. Understanding electron correlation—how electrons interact with each other—can improve fields like protein imaging and the development of next-generation electronics. Scientists believe that by studying the photoelectric effect at this level, they can one day control matter at its most fundamental level, opening the door to designing molecules with specific electronic properties.

Conclusion

The superfast study of the photoelectric effect is uncovering previously hidden details about the behavior of electrons and matter. As physicists continue to refine their techniques and push the boundaries of what we know, new materials and technologies will emerge from these insights—often in ways that we cannot yet imagine.

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

Source: The Hindu

3. What the Internet Archive case in the U.S. means for digital book-lending

Introduction

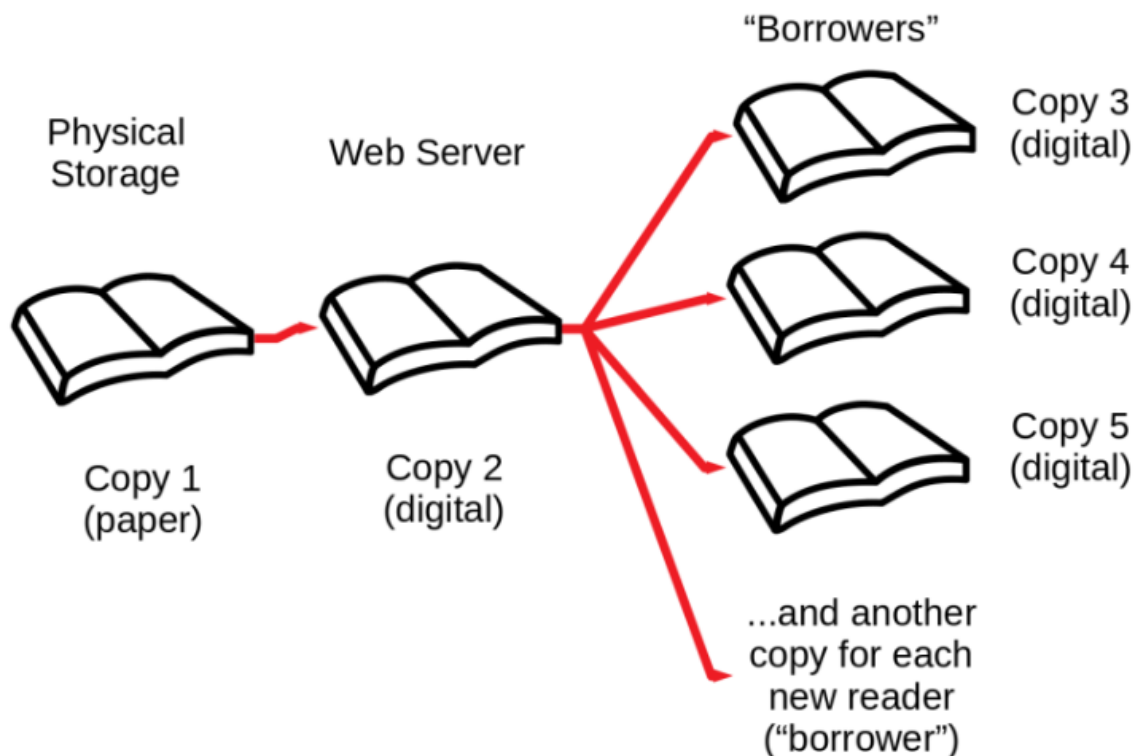
The Internet Archive (IA) is a non-profit that has digitally archived more than 835 billion web pages and 44 million books and texts. It has also archived millions of audio recordings, videos, images, and software programmes. Its archival efforts have democratised access to them for anyone with an internet connection. Books form a major part of IA's archival mission and the extent of access to digitised books is generally determined by the type of user. For example, persons with disabilities can get access to the full text of books that might be still under copyright protection, while others may generally get only a short preview of the book.

Problem experiments

Two of IA's techno-legal experiments prompted a major copyright tussle with book publishers. The first is the idea of Controlled Digital Lending (CDL): books are digitised and availed to readers on a 1:1 owned-to-loaned ratio. When a physical library has two physical copies of a particular book, only those two copies of that book can be lent. CDL used digital technologies

to lend books online in this way. The maximum number of books available to lend corresponded to the number of books IA or its partner libraries owned.

Controlled Digital Lending (CDL) and the Internet Archive



The second experiment was to liberalise the 1:1 policy during the COVID-19 pandemic as part of a 'National Emergency Library'. IA did this for less than three months, stopping when publishers initiated legal action citing violation of copyright, in Hachette Book Group, Inc. and others vs. Internet Archive.

The four horses of 'fair use'

The core issue before the district and the appellate courts was CDL's legality. That is, since CDL involved making digital copies of books, and since IA didn't deny lending those digitised books, did CDL constitute 'fair use' under U.S. copyright law? The district court took the view that IA did infringe copyright and that CDL didn't qualify as 'fair use'. When IA appealed, the appellate court reaffirmed the district court's verdict in favour of the publishers.

U.S. courts generally look at four factors as part of a 'fair use' analysis — purpose and character of use; nature of the copyrighted work; amount and substantiality of the portion used in relation to the copyrighted work as a whole; and effect of the use upon the potential market for or value of the copyrighted work. The appellate court's perspective on two of these dimensions is worth reflecting on.

Whether the disputed use is 'transformative' is an important sub-factor of the 'purpose and character of use' condition. Drawing on legal precedents, IA argued its use made book-lending

more efficient and enabled use-cases not possible with print books or physical lending. But the court held that IA's actions weren't 'transformative' as their copies served the same purpose as that of the original work, without meaningfully adding new features.

Second, some judges and scholars believe the 'effect of the use on the potential market for or value of the works' should be the most important factor in 'fair use' analysis. Here, the appellate court said IA bore the burden of proving there was no market harm for copyright holders. According to the court, while the publishers hadn't produced any empirical evidence, it was "reasonable and logical" to conclude IA's digital books worked as a competing substitute for licenced editions of physical books. The court also opined that if IA's practices were to become unrestricted and widespread, they would annihilate publishers' markets across formats. The court discarded the data IA had shared regarding the reportedly negligible effect CDL would have had on the sales of copyrighted work.

The future of CDL

It's possible the IA's 'National Emergency Library' project triggered a panic among the publishers and also predisposed the judges to this outcome. This said, the long-term consequences of the court's approach could matter more.

CDL has had a significant effect: it made the book-lending enterprise more efficient in the digital space and era and ensured people around the world could access books in a legitimate manner (without resorting to piracy, for example), and without causing substantial economic harm to the authors and the publishers.

On the flip side, if we extrapolate from the court's logic in this decision, we could argue that even lending by physical libraries falls afoul of the law because book publishers could argue that physical libraries are eating into the sale of their books. However, as experience has taught us, book-purchasing practices can work differently: readers will continue to buy books despite their being available in a library. Copyright laws in different jurisdictions have allowed libraries to let patrons borrow books in view of the broader public benefits, even if it may cause some economic harm to publishers and/or authors.

Relevance: GS Prelims; Science & Technology

Source: The Hindu