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## India's Science and Technology Sector

### Why in news?

The year 2022 marks the 25 years since we started celebrating the National Technology Day (May 11).

### What is so special about May 11?

- On May 11, 1998 3 special technologies were launched which includes
  - **Operation Shakti** ( Pokhran-II nuclear tests)
  - Successful test firing of **Trishul missile**
  - First test flight of the indigenously developed aircraft **Hansa**
- The achievements of May 11, 1998 contributes significantly to the economy.

**TRISHUL** - Short range low-level surface-to-air missile

**HANSA-New Generation (HANSA-NG)** - India's first indigenous Flying Trainer. It is the revamped version of the original HANSA developed in 1993.

### What is the journey of India's nuclear program?

- **Homi Bhabha** - India's nuclear programme can be traced to the work of physicist Homi J Bhaba.
- In 1945, Tata Institute of Fundamental Research, India's first research institution dedicated to the study of nuclear physics was opened in Bombay.
- **DAE** - In 1954, the Department of Atomic Energy (DAE) was founded, with Bhabha as director.
- **NPT** - In 1968, the Non-Proliferation Treaty (NPT) came into existence.
- The treaty defines nuclear-weapon states as those that have built and tested a nuclear explosive device before January 1, 1967 (The US, USSR, the UK, France and China) and effectively disallows any other state from acquiring nuclear weapons.
- India is one of the few non-signatories of NPT.
- **Vikram Sarabhai** - Bhaba's successor at the DAE, Vikram Sarabhai, had worked to significantly broaden India's nuclear technology
- **Pokhran-I** - On May 18, 1974, India carried out its first nuclear test at the Pokhran test site.
- Pokhran-I, codenamed **Operation Smiling Buddha**, would be billed as a "peaceful

nuclear explosion”, with “few military implications”.

- **Missile development** - In 1983, the Defence Research and Development Organisation’s (DRDO) funding was increased and Dr APJ Abdul Kalam was put in charge of India’s missile programme.
- **CTBT** - India also *did not sign the Comprehensive Test Ban Treaty (CTBT)* that was finalised in 1996.
- **Pokhran-II** - In 1998, India responded to Pakistan’s launch of Ghauri missile with ***Operation Shakti*** (Pokhran-II).
- Indian Government declared itself as a state possessing nuclear weapons following Pokhran-II.

### What are the other major initiatives in S&T sector?

- **Atal Innovation Mission (AIM)** - Established by NITI Aayog, it fosters a robust entrepreneurial landscape in India.
- Various programs of AIM are
  - Atal Tinkering Labs (ATLs) for schools, Atal Incubation Centers (AICs) for start-ups and entrepreneurs,
  - Atal Community Innovation Centers (ACICs) for grassroots innovation,
  - Atal New India Challenges (ANICs) for national-impact innovations and
- **Council of Scientific & Industrial Research (CSIR)** - Plays a crucial role in supporting not only industrial R&D for established industries but also startups and MSMEs.
- **The National Institute of Ocean Technology (NIOT)** - An *autonomous body under the Ministry of Earth Sciences*.
- Design, develop, and demonstrates technologies for the sustainable utilization of ocean resources (**Example - Matsya 6000**).
- **The Department of Atomic Energy (DAE)** - Committed to deploying atomic power for improving life quality and fostering national development.
- Has developed indigenous production methods for rare earth permanent magnets.
- Laid the foundation for a TIFRI campus in Hyderabad and the Laser Interferometer Gravitational Wave Observatory-India (LIGO-India) project.
- **The Indian Space Research Organization (ISRO)** - Space science data from missions like Chandrayaan and Mangalyaan is used for hackathons and workshops.
- The virtual space park, ***SPARK***, offers students exposure to space programmes, while ISRO’s STEM portal, ***Jigyasa***, encourages online education and innovation.
- The ***Space on Wheels programme*** consists of mobile space museums aimed at promoting awareness and education for rural students.

### What are the notable achievements of India?

- India as a pharmaceutical hub of the world
- Indian IT industry gearing up to drive the world’s IT enabled services
- Democratisation of financial transactions by digital payment gateways
- Making of indigenous BioJet fuels
- Mapping of subsurface water channels for sustainable use of water
- Making of indigenous light combat aircraft

- Digitisation of many aspects of trade
- Moving firmly towards a hydrogen economy

### **What are the challenges?**

- Lack of urban infrastructure and planning
- Low diversification of agricultural produce
- Lack of promotion of artificial intelligence technologies in all industrial segments
- Inadequate investments in research and development

### **What is the way ahead?**

- Scientists, innovators, and entrepreneurs should be encouraged to pursue their endeavors to create a brighter future for India.
- There is a need to unleash the immense potential India holds in various fields, from atomic energy to space exploration and biotechnology.

### **References**

1. [The Indian Express | India Nuclear Program](#)
2. [The Indian Express | India Initiatives](#)
3. [The Indian Express | Challenges](#)



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