India’s Nobel Aspiration

Why in News?

It has been 94 years since an Indian won a Nobel Prize in the sciences — Physics, Chemistry or Medicine , while working in India.

How are Nobel prizes awarded?

- **Nomination** - Every year, a select group of hundreds to thousands of people like university professors, scientists, past Nobel laureates, and others, are invited to nominate potential candidates.
- Names of nominated candidates are not made public until at least 50 years later.

The nominations for Physics and Chemistry Prizes are available till 1970 while those for Medicine have been revealed only till 1953.

- **Dominance of Jews** - Of the 653 people who have won the Nobel Prize for Physics, Chemistry or Medicine, more than 150 belong to the Jewish community.
- But Israel, considered the Jewish homeland, has won only four Nobel Prizes in science, all for Chemistry.
- **Dominance of West** - The science Nobels have been overwhelmingly dominated by scientists from the United States and Europe.
- Many of them came from other countries in search of better scientific infrastructure and ecosystem.
- **Under Performance of South and East** - Only 13 of the 227 winners of Physics Prize, 15 of the 197 winners of Chemistry Prize, and 7 of the 229 winners of the Medicine Prize have come from Asia, Africa or South America.
- Outside of North America and Europe, there have been only nine countries whose researchers have won a Nobel Prize in sciences.
- **Excellence of Japan** - The largest number came from Japan, which has 21 of non-American European laureates.

India’s Science Nobel Laureates
- **Sir. CV Raman** - Nobel Prize in Physics in 1930 for Raman Light scattering effect. - **Indian-origin scientists** ■ Har Govind Khorana in Medicine in 1968 ■ Subrahmanyan Chandrasekhar in Physics in 1983 ■ Venkatraman Ramakrishnan in Chemistry 2009.
Nominated Nobel Laurate Scientists in the Past

- **Physics**- Meghnad Saha, Homi Bhabha and Satyendra Nath Bose.
- **Chemistry** - G N Ramachandran and T Seshadri.
- **Medicine or Physiology** - Upendranath Brahmachari.
- **ECG Sudarshan(Indian Origin)** – He made path-breaking discoveries in the field of quantum optics.

Other Famous Indian Scientists

- **Jagadish Chandra Bose** - First person to demonstrate wireless communication way back in 1895.
- **K S Krishnan** - A student and close collaborator of C V Raman in his laboratory, acknowledged as the co-discoverer of Raman scattering effect.
- **CNR Rao** – His work in solid state chemistry has long been considered worthy of a Nobel.

What are the challenges in India's science research ecosystem ?

- **Inadequate Basic Research** - Few institutions are engaged in cutting edge research.
- **Short of Researchers** - The number of researchers as a proportion of population is five times lower than the global average.
- **Brain Drain** - In 2022, the number of Indian students leaving the country for higher education reached a six-year high of 770,000 and over 1.6 million people have relinquished Indian citizenship since 2011.
- **Low levels of public funding** - In 2020-21, gross expenditure on research and development (GERD) was about 0.7% of the GDP.

India falls behind major developed and emerging economies such as China (2.4%), Germany (3.1%), South Korea (4.8%) and the United States (3.5%).

Comparison of research productivity and innovation metrics in selected countries (2021-22)

Country	Researchers per million inhabitants (2021) (FTE)	PhDs produced annually (2021) (Rank)	Publication output (2022) (Rank)	Top 1% most cited articles (% share)	Patents granted (2022) (Rank)
India	262	40,813 (3)	3,06,800 (3)	0.7	30,490 (6)
The U.S.	4,452	69,525 (1)	15,06,000 (1)	1.88	3,23,410 (2)
The U.K.	4,491	27,366 (5)	2,87,200 (4)	2.35	10,578 (15)
China	1,687	53,778 (2)	9,78,100 (2)	1.12	7,98,347 (1)
S. Korea	9,082	13,882 (11)	1,09,200 (16)	1.02	1,35,180 (4)
Japan	5,638	15,804 (10)	1,71,000 (9)	0.88	2,01,420 (3)

Source: Publications data has been extracted from OpenAlex on February 7, 2024.

- **Under Performance of Private Sector** - The private sector contribution to India's GERD is still at the level of 36% whereas the remaining 64% is from public sources.
- **Low HEI Participation** – Higher Educational Institutions play a comparatively minor role in the overall R&D investment, contributing 8.8% ($1.5 billion).

- **Bureaucratic Hurdles** - The complex layers of administrative clearance, ranging from project proposals to budgetary allocations, contribute to delays and inefficiencies in the research ecosystem.
- **High Cost of Research** - Research activities require huge initial cost on human resources and infrastructural resources Opportunities for private research.
- **Lack of Incentives** - Limited availability of scholarships, research stipends, or financial aid for advanced research degrees can make such programmes economically burdensome for students.
- **Deficiency in Collaboration** - Limited shared spaces and resources for interdisciplinary activities hinders collaboration and converge and exchange ideas for interdisciplinary research.

What are India's prospects in research activities?

- **Recognition** – The call of "Jai Jawan, Jai Kisan, Jai Vigyan, Jai Anusandhan" is intended to reinforce the foundation of research and innovation for development.
- **Increase in Fiscal Support** – In the interim Budget for 2024-25, a corpus of ₹1 lakh crore has been announced to bolster the research and innovation ecosystem.
- **Human Resource Potential** - Annually, India generates an impressive 40,813 PhDs and is in 3rd place after the United States and China.
- **High Research Output** - India's research output remains substantial, ranking 3rd globally, with over 3,00,000 publications in 2022.
- **Patent Improvement** - India also demonstrates commendable performance in patent grants, securing the sixth position globally with 30,490 patents granted in 2022.
- **Policy Boost** - Initiatives such as the National Deep Tech Startup Policy (NDTSP) signal a strong commitment to technological progress and innovation.
- **Bridging the Funding Gap** - Anusandhan National Research Foundation (ANRF) to fill R&D investment gap while nurturing a robust research culture within HEIs.

What lies ahead?

- Collaboration between the government, business enterprises and HEIs is essential to maximise the positive impact of science, technology, and innovation.
- Creating a conducive environment that emphasizes the benefits and opportunities associated with advanced research degrees is crucial for overcoming the enrolment challenge.
- Provide an efficient mechanisms that can facilitate swift approvals and clearances for research projects in specialized domains.

References

1. The Indian Express | No Indian Nobel in 94 years
2. The Hindu | India's R&D Funding