

### India science management

- India's low overall expenditure on research and development (around 0.7% of GDP, compared to 3.5% for the United States and 2.4% for China) is but one aspect constraining its scientific outcomes.
- In 2022, the Indian Space Research Organisation stood a distant eighth on launch numbers, with foreign startups racing ahead on key technologies such as reusable rockets. Likewise, the lead in nuclear energy has been frittered away, being latecomers to small modular reactors; thorium ambitions remain unrealized.
- On critical science and technology themes such as genomics, robotics, and artificial intelligence, the situation is even more alarming.
- The direction and organization of science is inconsistent, even unfit, for the vital role that science must play going ahead. India's science is dominated by the public sector.
- Generic irritants associated with governmental bureaucracy, such as tardiness in approving crucial time-dependent funding, or equitable decision-making across different funding levels, are known problems.
- The basic assumption behind the outsized role played by scientists in Indian science administration is that a good scientist will also be a good science administrator.
- The lack of comprehensive training in selecting which particular metrics are appropriate under what circumstances leads to absurdities such as an entire project getting derailed due to a single invoice or acquisition
- The fact that there is no system of all India transfers of both scientists and science administrators only magnifies institutional capture and factionalism.
- Poverty forced the country to concentrate high end equipment in a handful of institutions, primarily the Indian Institutes of Technology in the 1960s.
- Since only these institutions had exclusive access to certain equipment, a system of gatekeepers emerged.
- These gatekeepers slowly began to capture positions, government patronage, and institutional power on the back of their monopoly over critical equipment.

### Challenges

- Even the U.S., with labs being embedded in the university ecosystem and run by scientists,

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selects scientists for administrative roles quite early on in their careers.

- Such selected science administrators, by and large, only carry out administrative tasks thereon and are groomed for the task, with very few of them ever going back to active science.

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### OpenAI and challenges

- The New York Times (NYT) sued OpenAI and Microsoft for copyright infringement.
- The IT industry was shaken recently by the brief ousting and swift reinstatement of OpenAI's outspoken chief executive officer, Sam Altman, but the fierce conflict between the providers of information used to train Artificial Intelligence systems and the operators went unaddressed.
- The NYT claimed that these companies use information from multiple sources to develop AI products.
- OpenAI argues that since using copyrighted content to train GenAI models "serves a new 'transformative' purpose", their actions should be permitted under "fair use"
- An epic battle pits push-button information generated by AI against

labor-intensive newsgathering.

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- From a legal perspective, it is a classic case of established law lagging behind new technology.
- The victory of Big Tech might deter human content producers.
- However, if The NYT prevails, GenAI companies might be required to compensate content producers for their use, which would significantly increase the cost of GenAI models.

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Indian meteorological department

### India Meteorological Department

**It was established in 1875.**

It is the National Meteorological Service of the country and the principal government agency in all matters relating to meteorology and allied subjects.

- To take meteorological observations and to provide current and forecast meteorological information for optimum operation of weather-sensitive activities like agriculture, irrigation, shipping, aviation, offshore oil explorations, etc.
- To warn against severe weather phenomena like tropical cyclones, northwestern, dust storms, heavy rains and snow, cold and heat waves,

etc., which cause destruction of life and property.

- To provide meteorological statistics required for agriculture, water resource management, industries, oil exploration and other nation-building activities.
- To conduct and promote research in meteorology and allied disciplines.

### Analysis

- the India Meteorological Department (IMD), entered the 150th year of its existence.
- While at present, it analyses the entire spectrum of climate and weather, from cyclones to fog, it was conceived, in colonial times, to probe the mysteries of the southwest monsoon.
- The British administration, concerned about revenues, was intimately aware of the influence of the monsoon on harvests and thus extremely invested in determining whether past observations of wind, rain, and sunshine could be used to predict future torrents and droughts.
- In the years since then, the IMD has collected gargantuan stores of meteorological data that underlie its forecasts of the monsoon.
- One such analysis of this data by researchers at the Council on

Energy, Environment and Water (CEEW) examines monsoon trends at the sub divisional (tehsil) level, from 1982 to 2022.

- This finds that monsoon rainfall is increasing in more than half, or 55%, of India's roughly 4,400 tehsils.
- About 11% of them saw decreasing rainfall.
- In those tehsils, about 68% experienced reduced rainfall in all four monsoon months, while 87% showed a decline during the June and July crucial for the sowing of Kharif crops.
- The southwest monsoon accounts for nearly 76% of India's annual rainfall, with about 11% from the northeast monsoon.
- That India's monsoons are increasingly prone to long, dry spells and punctuated by torrential wet spells is well documented though how much of it can be explained by natural variability and how much from global warming is an active area of research.
- While revenue extraction guided colonial interest in weather at the regional levels, such analyses have a new, contemporary relevance.
- This is to make region-specific plans to improve climate resilience and

channel necessary funds and resources.

- Prioritizing regional and sub-district forecasts over national ones, would be a commendable step forward by the government.

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### SLIM

- The Smart Lander for Investigating Moon (SLIM) is a Japanese Aerospace Exploration Agency (JAXA) mission designed to demonstrate accurate lunar landing techniques by a small explorer, with the objective of acceleration of the study of the Moon and planets using lighter exploration systems.
- SLIM is a small-scale exploration lander designed for pinpoint landings on the Moon's surface, reduction in the size and weight of equipment used in Moon landings, and investigation into the Moon's origins.
- It will also test technology fundamental to exploration in low-gravity environments, an important requirement for future scientific investigation of the solar system.
- The techniques demonstrated by this mission will pave the way for future lunar sample return missions. SLIM launched on 6 September 2023 and landed on the Moon on 19 January 2024 (

### SLIM Mission Objectives

- Following are the SLIM mission objectives thereby JAXA endeavors to contribute to future missions to explore the moon and other planets;
- Demonstration of the accurate lunar landing techniques embodied in a small explorer
- Acceleration of the study of the moon and other planets using the lighter exploration system
- Future solar science exploration will demand the level of navigation accuracy that JAXA is in the quest for through the SLIM mission.

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### Spacecraft and Subsystems

- SLIM is an irregularly shaped cuboid 2.4 meters in height, 2.7 meters across, and 1.7 meters deep, with a dry mass of 190 kg and a fully loaded mass of 710 kg.
- The body is built around the propellant tank as the structural element. Power is provided by thin-film solar cells and lithium-ion batteries.
- SLIM will carry a landing radar for the final descent and a multiband camera for mineralogical exploration of the surface, as well as a small laser retroreflector array. The landing system uses a crushable

aluminum foam base to absorb impact.

- Opioids and nonsteroidal anti-inflammatory drugs (NSAID)
- The sensation of pain, while universal, can also be influenced by culture.
- Though there is progress in understanding new pathways on how pain is processed at a biochemical level in the body, the current class of painkillers that consist of opioids and nonsteroidal anti-inflammatory drugs (NSAID) will remain the mainstay of treatment for a long time, said David Julius, biochemist, molecular physiologist and co -recipient of the 2021 Nobel Prize in Physiology.
- Opioids and non-steroidal anti-inflammatory drugs (NSAIDs) are the commonest drugs used to treat pain.
- Opioids mimic the actions of endogenous opioid peptides by interacting with mu, delta or kappa opioid receptors.
- The opioid receptors are coupled to G1 proteins and the actions of the opioids are mainly inhibitory.

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