Feature

INDIA'S SCIENTIFIC DIVERSITY: CASTE BARRIERS

Data show how privileged groups still dominate many of India's elite research institutes. **By Ankur Paliwal**

Samadhan is an outlier in his home village in western India. Last year, he became the first person from there to start a science PhD. Samadhan, a student in Maharashtra state, is an Adivasi or indigenous person — a member of one of the most marginalized and poorest communities in India.

For that reason, he doesn't want to publicize his last name or institution, partly because he fears that doing so would bring his social status to the attention of a wider group of Indian scientists. "They'd know that I am from a lower category and will think that I have progressed because of [the] quota," he says.

The quota Samadhan refers to is also known as a reservation policy: a form of affirmative action that was written into India's constitution in 1950. Reservation policies aimed to uplift marginalized communities by allocating quotas for them in public-sector jobs and in education. Mirroring India's caste system of social hierarchy, the most privileged castes dominated white-collar professions, including roles in science and technology. After many years, the Indian government settled on a 7.5% quota for Adivasis (referred to as 'Scheduled Tribes' in official records) and a

15% quota for another marginalized group, the Dalits (referred to in government records as 'Scheduled Castes', and formerly known by the dehumanizing term 'untouchables'). These quotas — which apply to almost all Indian research institutes — roughly correspond to these communities' representation in the population, according to the most recent census of 2011.

But the historically privileged castes — the 'General' category in government records —

"THE PLAYING FIELD IS NOT EQUAL AT ANY STAGE."

still dominate many of India's elite research institutions. Above the level of PhD students, the representation of Adivasis and Dalits falls off a cliff. Less than 1% of professors come from these communities at the top-ranked institutes among the 23 that together are known as the Indian Institutes of Technology (IITs), according to data provided to *Nature* under right-to-information requests (see 'Diversity at top Indian institutions'; the figures are for

2020, the latest available at time of collection).

"This is deliberate" on the part of institutes that "don't want us to succeed", says Ramesh Chandra, a Dalit, who retired as a senior professor at the University of Delhi last June. Researchers blame institute heads for not following the reservation policies, and the government for letting them off the hook.

Diversity gaps are common in science in many countries but they take different forms in each nation. The situation in India highlights how its caste system limits scientific opportunities for certain groups in a nation striving to become a global research leader.

India's government publishes summary student data, but its figures for academic levels beyond this don't allow analyses of scientists by caste and academic position, and most universities do not publish these data. In the past few years, however, journalists, student groups and researchers have been gathering diversity data using public-information laws, and arguing for change. *Nature* has used some of these figures, and its own information requests, to examine the diversity picture. Together, these data show that there are major gaps in diversity in Indian science institutions.
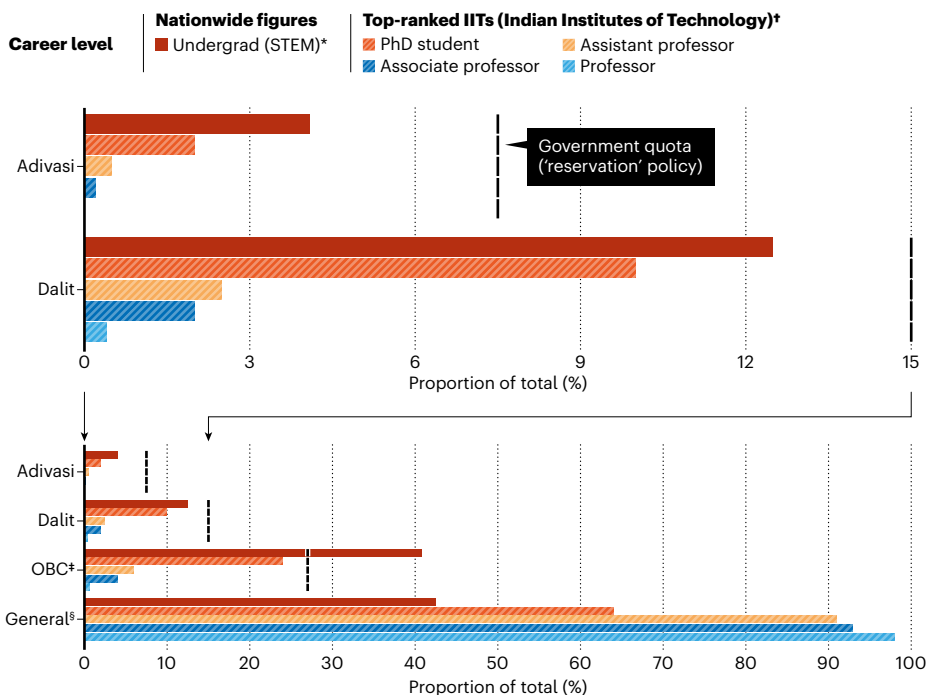
Early barriers

The challenge starts in schools and feeds through to university admissions. Adivasis and Dalits are under-represented in undergraduate science courses but not arts courses,
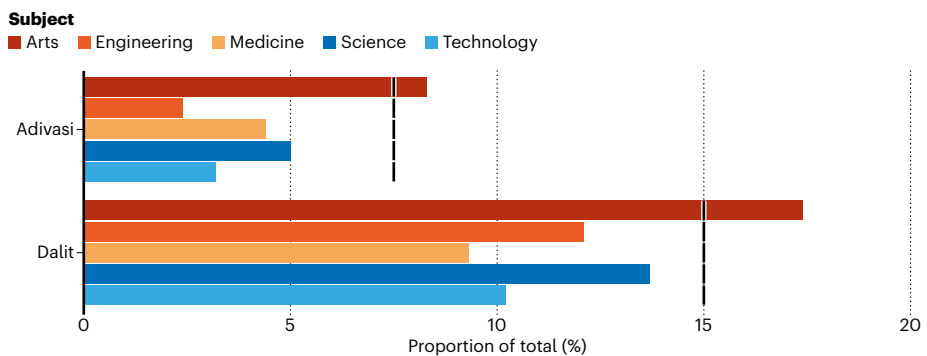
DIVERSITY AT TOP INDIAN INSTITUTIONS

Universities in India are failing to meet government quotas for marginalized communities in academia. The government provides detailed national figures for undergraduate and master's students, but not for academic levels above those; *Nature* collated figures from right-to-information requests. These data show that the representation of marginalized castes and other groups falls at higher academic levels.

Career level

Nationwide figures
- Undergrad (STEM)*

Top-ranked IITs (Indian Institutes of Technology)†
- PhD student
- Associate professor
- Assistant professor
- Professor

Government quota ('reservation' policy)

(Bar chart — Proportion of total (%), axis 0 to 15)
Categories: Adivasi, Dalit

(Bar chart — Proportion of total (%), axis 0 to 100)
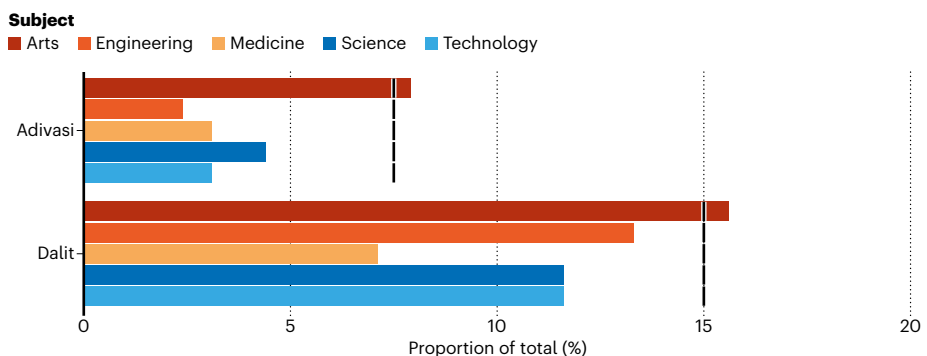Categories: Adivasi, Dalit, OBC‡, General§

UNDERGRADUATE STUDENTS IN INDIA

At undergraduate level, Adivasis and Dalits are under-represented in science courses but not arts courses (2019–20 government data).

Subject
- Arts
- Engineering
- Medicine
- Science
- Technology

(Bar chart — Proportion of total (%), axis 0 to 20)
Categories: Adivasi, Dalit

MASTER'S STUDENTS IN INDIA

At master's level, the under-representation of marginalized castes or groups in Indian universities worsens slightly, compared with undergraduates (2019–20 government data).

Subject
- Arts
- Engineering
- Medicine
- Science
- Technology

(Bar chart — Proportion of total (%), axis 0 to 20)
Categories: Adivasi, Dalit

*Science, technology, engineering and mathematics; government data 2019–20. †Data obtained from *Nature* information requests, 2020 (latest available at time of collection). PhD: IITs: Delhi, Bombay (Mumbai), Madras (Chennai), Kanpur, Kharaghur. All other career levels: IITs: Delhi, Bombay (Mumbai), Kanpur, Kharagpur. ‡Other Backward Classes. The Indian government refers to 'Other Backward Classes' as educationally and socially marginalized groups that are not Scheduled Castes (Dalit) or Scheduled Tribes (Adivasi). §'General' is the government term for all groups that are not OBC, Dalit or Adivasi: that is, historically privileged castes.

higher-education survey data show (see 'Undergraduate students in India').

That is not because arts courses are more popular, but because teachers and mentors specializing in science are rare in the rural high schools attended by these students, especially Adivasis, says Sonajharia Minz, a computer scientist and vice-chancellor of Sido Kanhu Murmu University in Dumka, eastern India. (Minz is the second Adivasi woman to hold a vice-chancellorship in India.)

Samadhan says that when he started a life-science bachelor's degree in 2009, students from privileged castes often called him and other students from marginalized communities "free off" — a slur referring to students on government aid.

Another marginalized group, termed 'other backward classes' or OBCs, makes up around 44% of science students and 30% of medical students at the undergraduate level. India's national proportion of OBCs is not known, because the country's census does not count them. But a government household survey from 2006 suggests they make up around 41% of the population. (Reservation policies require academic institutions to have 27% of admissions or recruitments from OBCs.)

In 2012, Samadhan progressed to a master's degree at a high-ranking university in western India. Student diversity at master's level is slightly lower than at the undergraduate level, data show (see 'Master's students in India').

During his master's, Samadhan often considered dropping out because he felt intimidated by the English-speaking culture and intense coursework that he wasn't used to. This is a common experience among students from underprivileged communities, says Akash Gautam, a Dalit and an assistant professor of neuroscience at the University of Hyderabad. "Many of them are first learners in their families. They need more time and support from the universities, which they don't get."

PhD dip

At the PhD level, the proportion of marginalized communities dips further — particularly at elite institutions. Data for PhD courses in 2020 at five high-ranked IITs, collected by *Nature*, show an average of 10% representation for Dalits and 2% for Adivasis — slightly lower than the average for five mid-ranking IITs. India's top-ranked university, the Indian Institute of Science (IISc) in Bengaluru, fares badly too (see 'PhD students in India').

"Let's face it, a PhD is somewhat of an elite pursuit" requiring financial support from families, says an IIT Delhi assistant professor from a privileged caste, speaking on condition of anonymity. Students from marginalized castes also often lack the recommendation networks and interview training to get recruited to PhD programmes, the assistant professor says.

Even when they start a PhD, many still struggle to find a good mentor willing to take them on. It is "quite common" for privileged-caste professors not to supervise students from marginalized communities, says Kirpa Ram, who belongs to the OBC grouping and is an assistant professor of environmental sciences at the Banaras Hindu University in Varanasi.

An Adivasi PhD student from a science department at Delhi University, for instance, told *Nature* that in 2018, when she approached a privileged-caste professor to be her supervisor, he responded that she was a "quota candidate" and could find a supervisor anywhere.

Gautam and other scientists told *Nature* that sometimes privileged-caste professors don't provide the extra mentoring that students from underprivileged backgrounds might need — leading some to quit before completing their PhDs. "It's a tactic," Gautam says.

Staffing fall

Very few doctoral students from marginalized castes reach staff positions in elite institutes (see 'Faculty members in India'). At higher-tier IITs and the IISc, 98% of professors and more than 90% of assistant or associate professors are from privileged castes, *Nature* found. In the Mumbai-based Tata Institute of Fundamental Research (TIFR), all professors are from the privileged castes, the data it provided to *Nature* suggest. TIFR belongs to a class of federally funded 'Institutions of Excellence' exempt from following reservation policies.

Some premier institutes are doing a little better. At the Council of Scientific and Industrial Research, a group of 38 labs, 18% of researchers (combining senior staff grades) were Dalits and 4% Adivasis, according to data *Nature* received from 31 of those labs.

Funding mismatch

Most of India's research funders don't disclose data on funding by caste, or don't collect them in the first place. But the Department of Science and Technology (DST), one of India's two main science-funding government agencies, did share data with *Nature* on postdoctoral researchers whom it had awarded INSPIRE Faculty Fellowships — positions aimed at supporting young talent, which represent an important but small part of the DST's total funding. Between 2016 and 2020, 80% of recipients were from privileged castes, just 6% were Scheduled Castes (Dalits) and less than 1% Scheduled Tribes (Adivasis). The DST says the selection was "strictly based on merit". Funding given by the DST's Technology Development and Transfer Division showed a similar pattern (see 'Diversity in India's research funding'). In both cases, the DST didn't share application success rates.

In the past few years, groups of activists, students and researchers have been pushing institutions not only to follow quotas but also

PHD STUDENTS IN INDIA

Data from a dozen Indian universities and institutes, sourced through information requests, show under-representation of marginalized castes and other groups in PhD programmes.
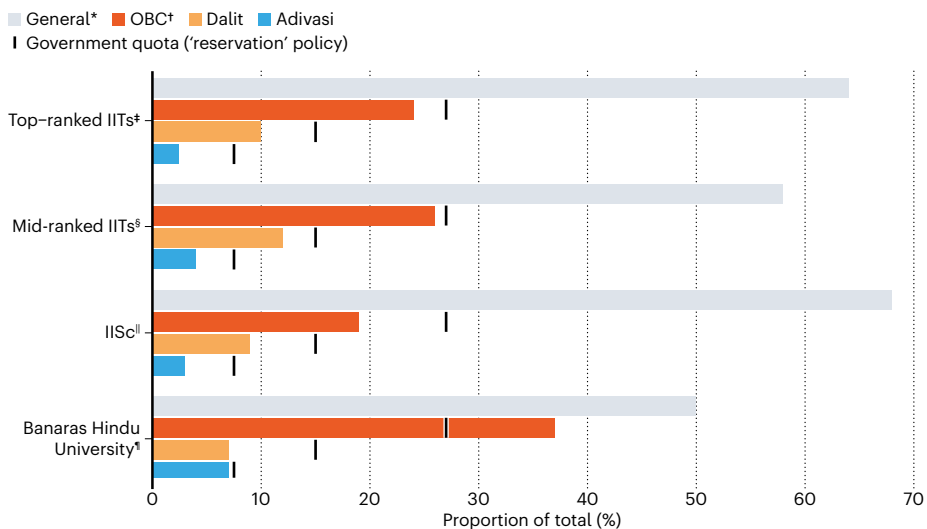
FACULTY MEMBERS IN INDIA

Data from 13 elite institutions in India show that a very low proportion of faculty members are from marginalized castes, especially at the assistant professor level and above.
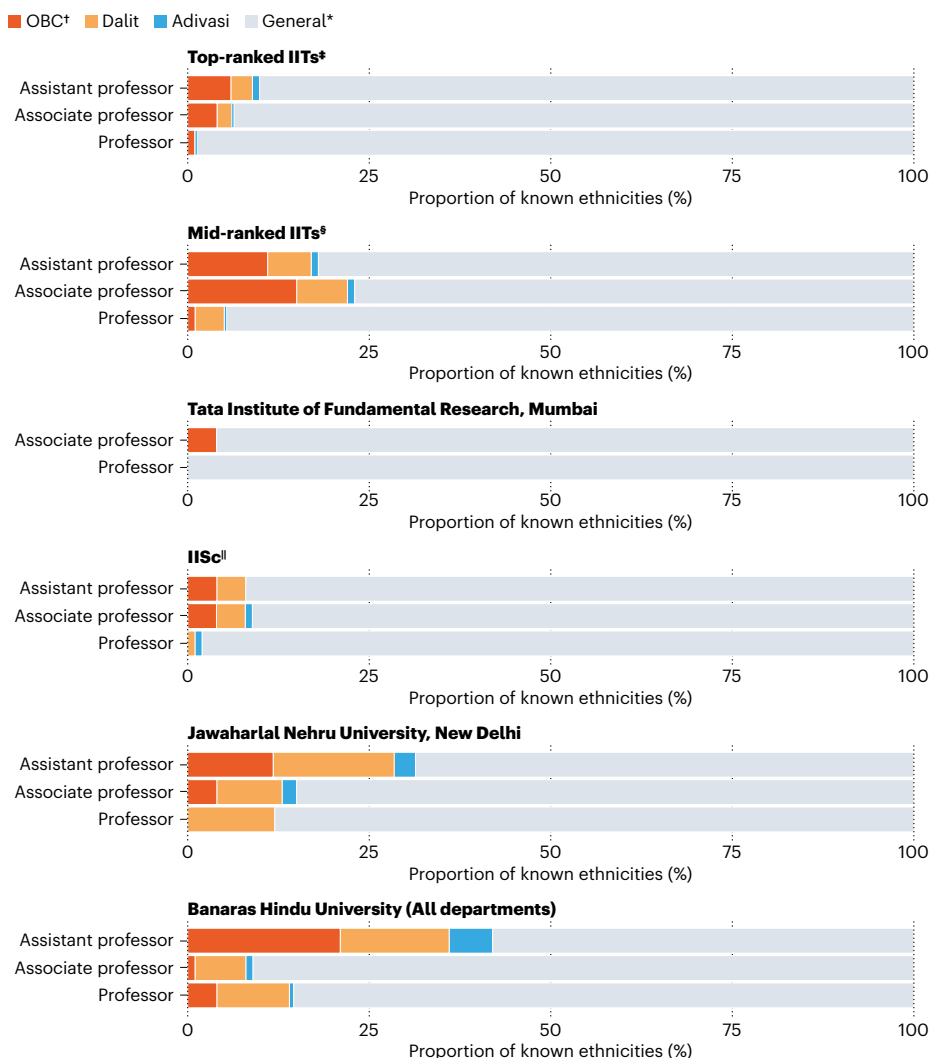
*Groups that are not Dalit, Advasi or OBC. †'Other backward classes'. ‡Delhi, Bombay (Mumbai), Madras (Chennai), Kanpur, Kharagpur. IIT Madras didn't provide faculty data. §Dhanbad, Patna, Guwahati, Ropar, and Goa. For Faculty figures, Varanasi replaced Ropar. IIT Goa was created too recently to have an official ranking. ‖Indian Institute of Science, Bengaluru. ¶Faculty of Science data shown. All data from *Nature* information requests, 2020 (latest available at time of collection), except for Patna, Goa and Guwahati from requests by the Egalitarians group.

Feature

Sonajharia Minz (front right) says better support systems are needed for marginalized groups.

to better support researchers from underprivileged communities. "We are doing this to hold a mirror to these institutes to show how ugly they are," says a spokesperson for Egalitarians, an organization that tries to collect and publish diversity data.

The issue is part of a wider recognition of how privileged-caste groups have been discriminating against marginalized communities — emboldened by India's pro-Hindu prime minister Narendra Modi, say some academics who spoke to *Nature* but did not want their names on record.

Some minority religious groups in India, such as Muslims — who are present across a variety of social and caste divisions, including Dalits — also face structural inequities in society. According to the 2011 census, Muslims make up around 14% of the country's population, but only 5.5% of those enrolled in higher education in 2019–20 were Muslims, survey data suggest.

Because no more detailed data were available, *Nature* asked IITs and other institutes for figures to do with Muslim representation.

Most replied that they didn't have the figures, but the sparse data that a few institutions shared suggest that Muslims are under-represented in elite academic institutes. In 2020, Muslims made up less than 5% of PhD students in IIT Madras in Chennai and less than 1% of science-teaching faculty in IIT Kharagpur; both are prestigious institutes. However, in IIT Dhanbad, a mid-ranking institute in a region where Muslims are not unusually numerous, 55% of PhD students were Muslims.

The rising criticism of under-representation and discrimination in academic institutions, particularly around caste, is prodding some institutes into action. India's Ministry of Education, which didn't respond to *Nature*'s request for an interview, has several times since 2019 told federally funded institutes, including the IITs, to comply with reservation norms when recruiting teachers.

In 2019, Modi's government expanded the reservation quotas by 10% to cover lower-income people not part of marginalized castes or groups, who would otherwise fall in

the 'General' category; they would be categorized under 'Economically Weaker Sections' of society. The extension is controversial but, after legal challenges, was upheld in a November 2022 ruling by India's Supreme Court.

Representatives at four IITs talked on record to *Nature* for this story; others didn't respond. "Equating under-representation with discrimination is incorrect. There is no discrimination," said Neela Nataraj, a mathematician and dean of faculty affairs at IIT Bombay in Mumbai. She accepted that the institute had a shortage of students and faculty members from some social categories, but said it was on a mission to improve representation through recruitment without compromising on quality, and through encouraging more students from under-represented communities to start PhDs. Angelie Multani, a professor of literature who was appointed in August 2022 as IIT Delhi's first dean to increase diversity on campus, says the institute recognized that, like others, it had "under-representation of marginalized sections of society" and was working to improve the situation through measures such as hiring drives. And Amalendu Chandra, dean of faculty affairs at IIT Kanpur, says that the institute had offered appointments to 48 teachers from marginalized communities in the past year. (The institute has 413 faculty members, according to its website).

At IIT Goa, Amaldev Manuel, a computer scientist and chair of PhD admissions in 2022, noted that the institution's acceptance rate for PhD applicants from marginalized communities was higher (at above 1%) than for the 'general' category (below 1%), even though it received fewer applications from people of less privileged castes.

Some researchers, such as Ramesh Chandra, doubt that diversity initiatives by institutions will make a big dent until India's government takes action against institutes for violating reservation policies. "You have to take punitive action against the [institutes'] directors," says Chandra. "Remove them."

At the very least, says Ram, the government should require universities to publicly disclose diversity data and monitor compliance. And Minz thinks that for the situation to change, support systems need to be created at every step from school education to high-level recruitments in academia — such as training on grant-proposal-writing and communication skills for researchers recruited from marginalized communities. "The playing field is not equal at any stage," she says.

For Samadhan, the marker of change would be more personal. "The day I would be able to say my full name without hesitation in an institute, I will feel that equality has arrived," he says.

Ankur Paliwal is a freelance journalist in New Delhi.

DIVERSITY IN INDIA'S RESEARCH FUNDING

Data on two funding schemes, shared with *Nature* by India's Department of Science and Technology (DST) under information requests, suggest most money goes to researchers from privileged castes or groups.

INSPIRE faculty fellowship for postdoctoral research, 2016–20

OBC **12.0%** Adivasi **0.7%** General **80.0%**

Dalit **6.0%**
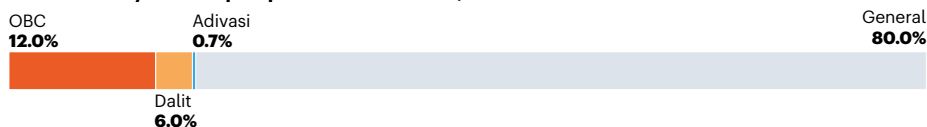
DST Tech Development and Transfer Division grants 2016–20

OBC **16.0%** Adivasi **0.4%** General **81.0%**

Dalit **4.0%**