# INDIA
## by the numbers

BY RICHARD VAN NOORDEN

*Highs and lows in the country's research landscape.*

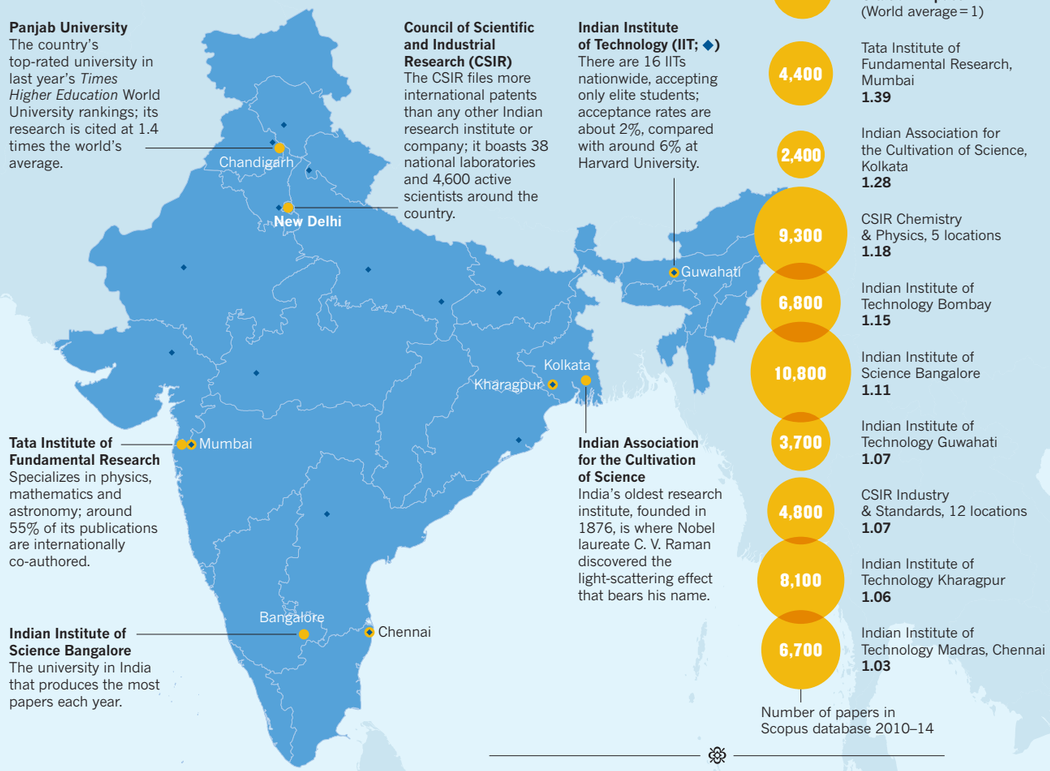
◆ Indian science is a study in contrasts. With its vast population and rapidly expanding economy, the country has ramped up scientific production at an impressive rate. India started the twenty-first century well behind Russia, France, Italy and Canada in terms of yearly publications and it now leads them all by healthy margins. It is quickly closing in on Japan.

Despite those gains, India is not yet a major player in world science. Its publications generate fewer citations on average than do those of other science-focused nations, including other emerging countries such as Brazil and China. Relative to its size, India has very few scientists; many Indian-born researchers leave for positions abroad and very few foreign scientists settle in India. The country invests a scant portion of its economy in research and development (R&D), and it produces relatively few patents per capita compared with other nations.

But there are bright spots. India boasts several world-class centres for science education, particularly the highly regarded Indian Institutes of Technology. Businesses in the country are investing more in R&D, which bodes well for future innovation. And more women are participating in science, although their numbers still fall far below those of men. ◆

### Elite research centres

India's 700 or so universities vary tremendously in quality. To identify the leading science institutions, *Nature* looked at the citation rates in Elsevier's Scopus database for institutes that had produced more than 2,000 papers between 2010 and 2014.




**Panjab University**
The country's top-rated university in last year's *Times Higher Education* World University rankings; its research is cited at 1.4 times the world's average.

**Council of Scientific and Industrial Research (CSIR)**
The CSIR files more international patents than any other Indian research institute or company; it boasts 38 national laboratories and 4,600 active scientists around the country.

**Indian Institute of Technology (IIT; ◆)**
There are 16 IITs nationwide, accepting only elite students; acceptance rates are about 2%, compared with around 6% at Harvard University.

**Tata Institute of Fundamental Research**
Specializes in physics, mathematics and astronomy; around 55% of its publications are internationally co-authored.

**Indian Association for the Cultivation of Science**
India's oldest research institute, founded in 1876, is where Nobel laureate C. V. Raman discovered the light-scattering effect that bears his name.

**Indian Institute of Science Bangalore**
The university in India that produces the most papers each year.

### Top 10 institutions

Number of papers in Scopus database 2010–14

| | |
|---|---|
| 4,000 | Panjab University, Chandigarh<br>**Citation impact: 1.4**<br>(World average = 1) |
| 4,400 | Tata Institute of Fundamental Research, Mumbai<br>**1.39** |
| 2,400 | Indian Association for the Cultivation of Science, Kolkata<br>**1.28** |
| 9,300 | CSIR Chemistry & Physics, 5 locations<br>**1.18** |
| 6,800 | Indian Institute of Technology Bombay<br>**1.15** |
| 10,800 | Indian Institute of Science Bangalore<br>**1.11** |
| 3,700 | Indian Institute of Technology Guwahati<br>**1.07** |
| 4,800 | CSIR Industry & Standards, 12 locations<br>**1.07** |
| 8,100 | Indian Institute of Technology Kharagpur<br>**1.06** |
| 6,700 | Indian Institute of Technology Madras, Chennai<br>**1.03** |

**40%**
of Indian-born researchers were working overseas in 2011 — the largest diaspora of any of the 16 countries in a survey of researchers (see *Nature* **490,** 326–329; 2012).

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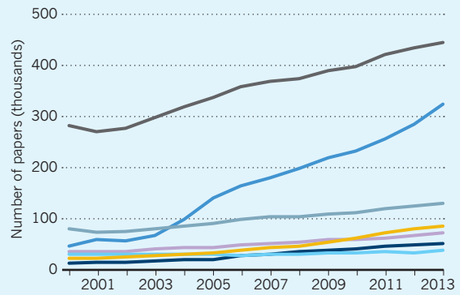
ELITE RESEARCH CENTRES: SCIVAL/SCOPUS; CSIR; IACS; *NATURE* **472,** 24–26 (2011); DESIGN: JASIEK KRZYSZTOFIAK/*NATURE*. MAP SHOWS LAND AREAS CURRENTLY ADMINISTERED BY THE INDIAN GOVERNMENT.

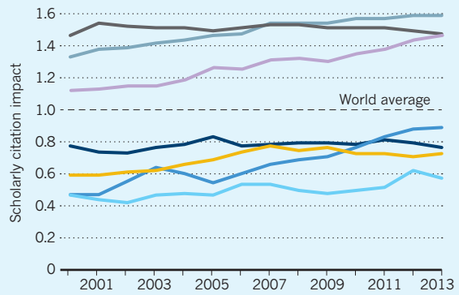
PUBLICATIONS: SCIVAL/SCOPUS; SCHOLARLY CITATION IMPACT: SCIVAL/SCOPUS; WORKFORCE: UNESCO; GRANTS TO WOMEN: DST

### Publications

Since 2000, India has almost quadrupled its scholarly output, but that rate is surpassed by Brazil's and China's. India underperforms relative to its gross domestic product (GDP) and population. And its scholarly impact remains low: in 2013, it was nearly 30% below the world's average.

US China UK India Italy Brazil Russia

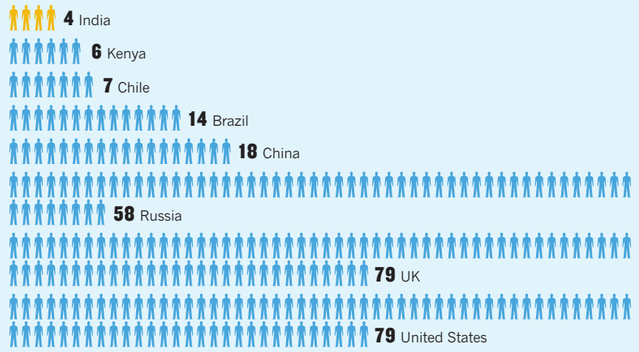



### Workforce

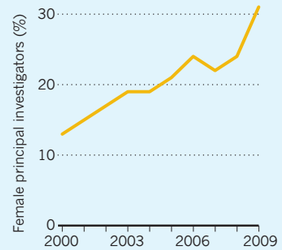
With only 200,000 full-time researchers (14% of them female) in a population of nearly 1.3 billion, India ranks below Chile, Kenya, and many other countries in terms of the density of its scientific workforce.

One researcher per 10,000 labour force



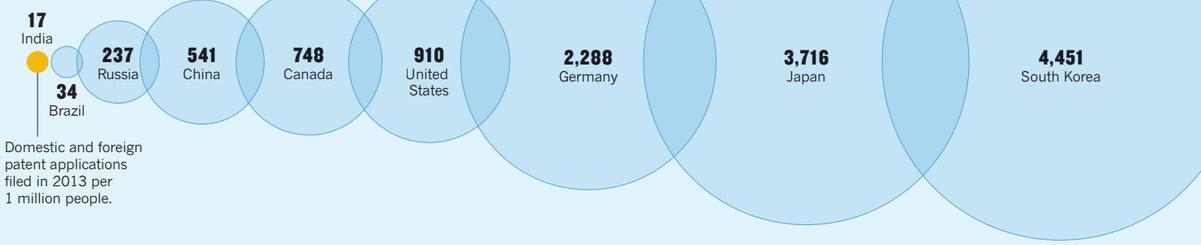

### Grants to women

More women are winning funding from competitive government grant schemes, according to India's Department of Science and Technology.




### Patents

India is one of the world's leading filers of patents but it registers far fewer applications per capita than any other top-filing nation. Multinational firms in India have boosted the country's rate of filing.




Domestic and foreign patent applications filed in 2013 per 1 million people.

PATENTS: WIPO; R&D INVESTMENT: UNESCO/DST; SPENDING PER RESEARCHER: UNESCO

### R&D investment

Whereas China's research spending has shot up to almost 2% of its GDP, India's languishes at around 0.9%, a figure that has changed little in more than a decade and lags behind both Brazil's and Russia's.

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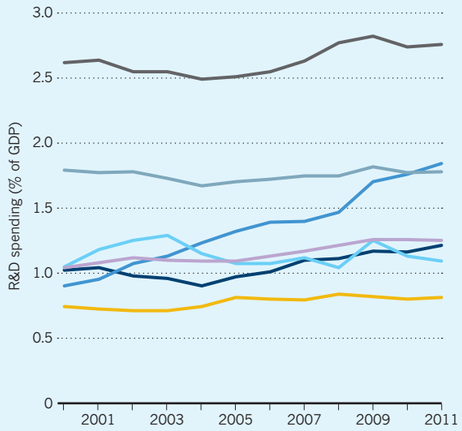


### Spending per researcher

India spends much the same per researcher as many other countries; figures are normalized for purchasing power and are in thousands of US dollars.