

# Central & South Asia

*India's dominance continues in this region, but its future funding is tenuous, while neighbouring smaller countries face more fundamental obstacles to scientific success.*

ARTICLE COUNT (AC): 1,574  
 FRACTIONAL COUNT (FC): 1,057  
 WEIGHTED FRACTIONAL COUNT (WFC): 944

The countries of Central & South Asia have spent the last decade building their science profiles by expanding their community of researchers. Nonetheless, this region finishes 6th out of 9 in this Nature Index, based on its 2014 weighted fractional count (WFC) of 944. Most of the region's publications in the Index focus heavily on chemistry or physical sciences (47.7% and 40.9% of the region's total WFC, respectively), leaving little capacity for work in life and earth and environmental sciences.

Looking at the reasons, it seems that trends in researcher mobility may play a role in keeping the region from producing more work published in the top journals. Brain drain, for instance, is a big problem for countries in the region — an exodus of top talent that benefits countries at the top of the scientific pyramid leaves other nations bereft of leading researchers. Gail Joseph, a researcher at North Carolina Agriculture and Technology State University, says, "I see so many Indians here [in the US] who are excellent researchers. They feel more appreciated here, plus the infrastructure and technology [are] much more advanced abroad."

While the lure of international institutions is a factor, scientists in the region do not regularly team up with researchers from other countries. With 33% of articles arising from international collaborative efforts, scientists in Central & South Asia collaborate on fewer projects than

the regional aggregate of the WFC for the Index (46%). When researchers in this region do collaborate internationally, it is with scientists from North & West Europe (44% of international collaborations) and North America (30%). "The trend is for countries in the region to work more with the West than building regional networks," says Ravi Silva, director of the Advanced Technology Institute at the University of Surrey in the United Kingdom.

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The lack of collaborations within the region could be explained by one local philosophy. "Our emphasis has been growing the talent in India," says physicist Ajay Sood at the Indian Institute of Science (IISc) in Bengaluru. "We have a very low percentage of people coming from other countries, almost negligible." Nonetheless, India performs reasonably well on the global level.

### INDIA'S DOMINANCE

India ranks 13th globally in terms of WFC and is by far this region's leader in science in the

Index, contributing 97.6% of Central & South Asia's WFC in 2014. For instance, India's 2014 WFC includes an article in *Nature Genetics* on heart disease in children, which reveals possible targets for therapies related to mutations in the *RAF1* gene.

Despite such clearly valuable research and India's WFC increasing by 8.3% from 2013 to 2014, some experts question the impact of India's publications.

Improving the quality of India's published papers will require more spending on research. Funding is divided into national laboratories that receive block grants and universities that compete for grants. Since there are more scientists in colleges and universities, they are competing for funds and working with limited resources. Moreover, Indian National Science Academy vice president S. C. Lakhota calls the funding competition "lengthy and painful for active researchers."

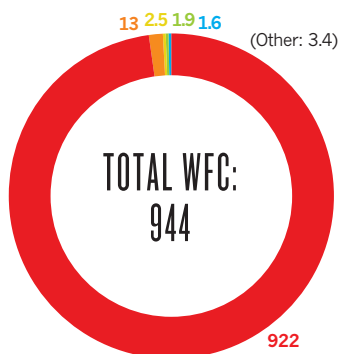
Consequently, the universities face challenges in attracting good scientists. Graduate students and young scientists are drawn more to research institutions than to universities, says Lakhota. This trend, he says, leads to "spiraling inequity in quality of resources and manpower." "Nearly all of the traditional teaching institutions suffer from lack of a critical mass of quality researchers and teachers."

Despite this precarious state of funding, Sood's IISc has top quality equipment, and it

## CENTRAL & SOUTH ASIA ANALYSIS

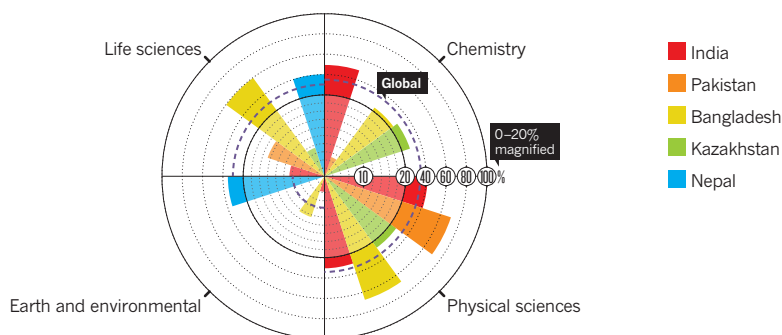
### Countries' weighted fractional count (WFC)

The most dominant leader in any region, India produced 98% of the Index articles from Central & South Asia.



### Relative subject area distribution

The countries in this region demonstrated some of the most diverse publishing, such as Pakistan's focus on physical sciences.\*



\*Each slice represents the proportion each subject area contributes to a country's overall WFC. Subject areas can overlap, so the total percentage may exceed 100%.

has attracted good researchers. Its WFC of 94 places it third among institutions in the region and 118th in the world. Other top research organizations include the Indian Institutes of Technology (IITs), which are spread across the country and which, in aggregate, ranks 51st in the world and 1st in the region with a WFC of 168. Reflecting India's focus on chemistry, IITs is one of the top institutions in the Index for chemistry worldwide, ranking 24th with a WFC of 107 — up 43% compared to its WFC in 2013.

Similar to the IITs, India's Council of Scientific and Industrial Research (CSIR), which ranks 72nd in the world with a WFC of 129, has dozens of labs and centres across India. It, too, is a key player in chemistry, being one of the top 30 institutions in the Index for this discipline with a WFC of 90. Unlike the IITs, CSIR falls into the category of a national lab, which guarantees block grants from the government.

**ABOVE AND BEYOND**

Looking only at international journals and funding doesn't tell the whole story, however. The success of India's Mars Orbiter Mission — which entered the Mars atmosphere in September and was recently reported to be so fuel efficient that the mission will last six months longer than originally planned — has been a major point of pride throughout the scientific community and the country in general. "It is a tremendous achievement at very low cost and successful at its very first attempt," says Venkatesh Narayanamurti, dean of Harvard University's School of Engineering and Applied Sciences. He calls the mission India's "single biggest accomplishment." Narayanamurti also highlighted another scientific accomplishment for India that will have a strong impact on technological capabilities: the development of the country's first regional GPS system, which is expected to be completed in 2015.

Despite these achievements, some researchers are disappointed that funding for research hasn't increased as they had hoped it would with the new government of Prime Minister



This launch put India's Mars Orbiter in the planet's atmosphere in September 2014.

Narendra Modi, who took office in 2014. Facing a slowdown in the economy, the Modi administration has failed in two budgets to boost R&D spending above 1% of the GDP. The funding increase of 4% was below-inflation and not enough to satisfy researchers.

"There is an apprehension in the Indian scientific community that from this year onward the past increase in funding will not continue and may actually turn into severe cuts for the basic sciences," says Kavita Dorai, a physicist at the Indian Institute of Science Education & Research Mohali in Punjab. "If this happens, it will have far-reaching consequences for both the scientific community and for the nation."

**LAGGING BEHIND**

The region's clear runner-up is Pakistan, which ranks 53rd in the world with a WFC of 13, down 29% compared to 2013. It has a sizable community of researchers approaching 53,000 — or about 295 researchers per million citizens — but it has yet to get a single university into the Index's top 10 institutions of the region. Similar to its neighbours, Pakistan's publication output leans heavily toward the physical sciences.

Even though Pakistan lags behind India in scholarly output, it has had some notable successes. In mid-December, Pakistan celebrated

the country's admittance as an associate member of CERN, the European Organization for Nuclear Research — a status not yet attained by regional rival India.

Pakistan's government is also moving forward with its initiative to close the gap between academia and industry in an attempt to boost the country's economy. The government has now supported the opening of 38 Offices of Research, Innovation and Commercialization (ORICs) in universities around the country since the initiative began in 2011. Aliya Rehman, director of the University of Karachi's ORIC, notes there is some resistance to these collaborations from both industry and academia. She recently conducted a survey that found that while hundreds of patents have been awarded to researchers at the University of Karachi, none of them have yet been commercialised. Rehman says this is due to lack of initiative and roadblocks in the process. "They do their research and it just goes in their cupboards," she said. One promising collaboration she is working on will link research being done on Pakistani seaweed with a company that has been manufacturing herbal medicine and cosmetics using imported seaweed.

Still, Pakistani researchers face many barriers that are causing many of the brightest to seek opportunities elsewhere, says Rehman. "You have no idea how difficult it is to do research in Pakistan." She points to the funding mechanism in particular. "The funding agencies are very slow to process the project applications and by the time the funding comes, the work has been done in some other part of the world," she says.

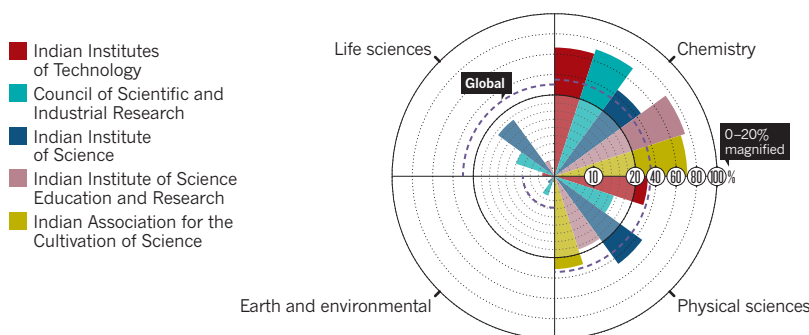
Exacerbating the situation, some countries in Central & South Asia are still facing obstacles that scientists in developed nations cannot even imagine. In Pakistan, for example, Rehman points to electricity shortages and political instability as major impediments to research, sometimes closing down the universities for days. "It is an extremely difficult position and that is why a lot of people are leaving," she says. ■

NATHAN G./HINDUSTAN TIMES VIA GETTY IMAGES

**CENTRAL & SOUTH ASIA ANALYSIS**

**Top 5 institutions' relative subject area distribution**

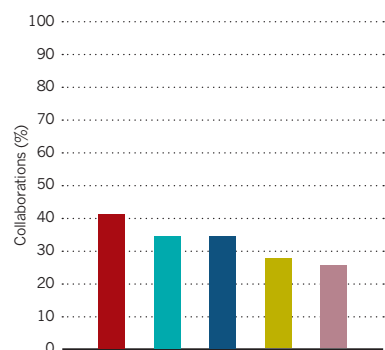
Since the top five institutions came from India, they reflected the country's emphasis on chemistry.\*



\*Each slice represents the proportion each subject area contributes to an institution's overall WFC. Subject areas can overlap, so the total percentage may exceed 100%.

**Top 5 institutions' collaborativeness**

Compared to top institutions in other regions, Indian institutions are more self-contained and collaborate far less.\*



\*Each bar represents the proportion of an institution's overall output in the Index (AC) stemming from domestic and international collaborations.