Do we lack courage in research?

C. V. Raman – arguably the icon for experimental research done in India – is often quoted as believing that while there was nothing inferior with the Indian mind, what we lacked was the courage to explore unusual avenues. In recent years we often hear of our tendency to do either 'me-too' research, or research that is incremental to the works of established researchers abroad. When we do perform path-breaking research, we are hesitant (scared?) to stick our neck out, but wait for confirmation (from established researchers abroad?) before disseminating our results. How often is an opportunity to be the first lost to the security of being an 'also ran'? Do we lack the courage that Raman worried about? I shall give an example that, unfortunately, involves established scientists and technology leaders; but the purpose of this letter is to change the attitude of our young researchers and research scholars.

The results obtained by ISRO's Moon Impact Probe (MIP) aboard Chandrayaan-1, detecting water on the lunar surface, were path-breaking. They were announced by ISRO at a press conference on 25 September 2009; some hours *after* it was announced that NASA's Moon Mineralogy Mapper (M3) had discovered water on the Moon. By the nature of the probes, the MIP data had definitely been received before the M3 data; it was claimed that the paper was also submitted much earlier. Could the ISRO result have been disseminated earlier, in an academically acceptable manner, and priority claimed? ISRO had apparently submitted its finding to at least two peer-reviewed journals and received rejections. There was no peer-reviewed acceptance when the ISRO announcement was actually made. The M3 paper also had authors from three leading Indian institutions who, ethically, could not guide the MIP ISRO team to claim priority for its path-breaking claim. This is where the need for self-assessment and the use of academically acceptable dissemination routes comes in.

While press conferences are not the desired route for releasing research results, preprint archives are a common route for priority establishing dissemination in many branches of science, and astrophysics is definitely one of them. This route would have required Raman's 'courage', since the likelihood of being wrong is more in the absence of peer-review. Publishing in a 'less popular journal' is an oft-practised route, as was followed by Bednorz and Muller when they first reported superconductivity in the copper oxides. This is where our present emphasis on the impact factor of a journal, while evaluating research publications, is a problem. This would require the involvement of UGC and MRD to change rules that value 'peer-appreciation' over self-assessment of the challenges thrown by new ideas or path-breaking works.

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Why Indians and not Chinese prefer USA for STEM?

Enrolments of international students in the US graduate schools rose for five consecutive years from 2009 to 2014. The year 2014 has seen the biggest increase of 20% with 16,235 first-time enrollees mainly in the physical and earth sciences. Brazil and India showed largest increase per nation, whereas China showed declining trends towards education in USA[1].

Since 2004, the Council for Graduate Schools (CGS) has conducted a multi-year empirical analysis of international graduate enrolment trends. With 17% of total graduate students in the US being international students, such analysis helps institutions to evaluate ongoing trends in the enrolment of students from abroad seeking Master's and doctoral degrees from US institutions.

Brazil, Canada, China, India, Mexico, South Korea and Taiwan are the seven key countries from where students go to the US for education. Among these, China, India and South Korea are the top three countries of origin of international graduate students in the US, accounting for about one-half of all non-US citizens on temporary visas attending US graduate schools[2,3].

The 2014 CGS survey results reveal substantial increase in offers of admission to prospective graduate students from India (24%), whereas offers of admission decreased to 2% in case of China (Table 1). This is the second consecutive year in which offers of admission for students from China did not realize a double-digit increase, whereas for India it is second consecutive year of double-digit increase. By field of study, the largest gains were in physical and earth sciences (20%), and engineering (11%). Physical and earth sciences include chemistry, computer and information sciences, earth, atmospheric and marine sciences, mathematics, physics and astronomy, etc. Another striking fact about the survey result is that growth in the rate of enrolment is higher in the top 10 institutions for Chinese students, whereas it is outside the top 100 institutions in the case of Indian students.

According to Jeffrey R. Allum, Director (Research and Policy Analysis, CGS), the dip in enrolments from China might be a result of the nation's students taking advantage of their home country's investment in graduate schools.

According to Nate Thompson, Associate Director of Communications, CGS 'China has made significant investments in its own graduate education system in recent years, viewing graduate education, as most developed and developing countries do, as a foundation for economic development. This creates new incentives, including financial support, for Chinese students to enroll in programs at home', (e-mail interview to *Current Science*). 'For India, the situation is quite different. The infrastructure of graduate

Table 1. Change in international offers of admission, 2010–2011 to 2013–2014

	Admission offers (%)			
Country of origin	2010–11	2011–12	2012–13	2013–14
China	21	20	5	–2
India	2	0	30	24
South Korea	–2	0	–11	–8
Taiwan	–	–4	–2	–8
Canada	–	9	0	3
Mexico	–	6	2	2
Brazil	–	6	23	94

education in India is not yet at a point where it can attract and support all of the Indian students who have the ambition and talent to pursue advanced degrees. The recent weakening of the Indian economy may also be leading some Indian students to set their sights on finding a job in the US post-graduation.'

China has not only given importance to retain its own students, but also to international students' education. In 1950, China received the first group of 33 students from the East European countries. By the end of 2000, the total number of international students in China has increased to 407,000. They are from more than 160 different countries. Among them, Chinese Government Scholarship students numbered 88,000, whereas self-financed students numbered 317,000. According to the data of the Institute of International Education on international student mobility in 2012, there are many more foreign students in China (3.28 lakh) than in Australia or Germany. China has become the third most favoured nation of international students after the US and the UK.

China seeks to host 500,000 international students by 2020. China, Singapore, Malaysia and Japan are the major Asian players in the race of attracting international students, whereas India does not seem to attract foreign students to bring foreign revenue and the best talents to its campuses. Currently, 22,385 Indian students are in the UK and 96,754 in the US, whereas merely about 27,000 international students are studying in Indian campuses.

In 2008, the Chinese government began a national plan for medium and long-term education reform and development 2010–2020, where the focus was from kindergarten to Ph D level education[4]. The plan was drafted under the close supervision of President Hu Jintao and Premier Wen Jiabao, in order to speed up the process of building China into an educationally advanced country rich in human resources. To raise the quality of higher education, importance was given to raising quality all round, bettering talent cultivation, elevating research levels and optimizing a distinctive higher education structure. To attract foreign students to Chinese campuses, the emphasis was laid on promoting international cooperation and exchanges, introducing quality education resources abroad and upgrading exchanges and cooperation.

This plan of changing China from a production to an innovation giant seems to be bearing fruits. The Chinese Government's move from 'made in China' to 'created in China' by 2020 looks possible to achieve in a set time-frame. Other Asian countries, especially India should take note of this.

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Association of citrus bacterial canker pustules with leafminer (*Phyllocnistis citrella*) tunnels in Iran

Citrus is one of the horticultural products that includes some of the most important tropical as well as subtropical plants. Iran, producing 3.38% of the world's citrus, is ranked seventh in the world[1].

Citrus bacterial canker (CBC), caused by *Xanthomonas axonopodis* pv. *citri* (Xac), is considered one of the most important diseases of citrus trees in Southern Iran. Most of the citrus species in the Rutaceae family are affected by CBC. The Asiatic form of CBC is pathogenic to almost all varieties of citrus and some species in the Rutaceae[2,3].

During 2000–2001 and 2005–2007, the canker disease became endemic with reduced severity in Hormuzgan province, Southern Iran. This was mainly due to the unfavourable climatic conditions, particularly low rainfall during the previous years. Citrus pustules are usually observed on the lower leaf surface alongside the galleries caused by *Phyllocnistis citrella* in this region.

The habits of larvae of citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) facilitate the entrance of pathogenic microorganisms into the leaf, especially bacteria of Xac[4]. Damage by the leafminer has been