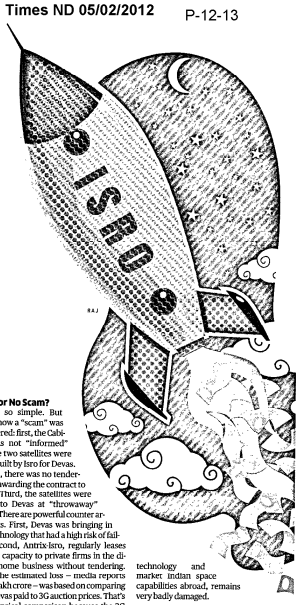
Newspaper Clips

February 5, 2012

Economic Times ND 05/02/2012 P-12-13

No Space for Private Business

The Antrix controversy has scared off risk-taking entrepreneurs from entering India's space industry. Who'll now bring hi-tech chutzpah to what can be an Indian success story?



:: Josy Joseph

It's been a rough fortnight for the folks associated with India's space industry. Allegations flew faster than rockets. When the Department of Space barred former chief Madhavan Nair and three other scientists from any future re-employment in any government related work, battle lines were drawn within India's space research community.

Even as Nair described the January 13 order of the government as a "witch hunt" and squarely blamed current Indian Space Research Organisation (Isro) chief K Radhakrishnan for misleading the government in the much-maligned Antrix-Devas deal, the real question is whether this controversy will hamstring India's efforts in getting private-sector involvement in the fast-growing space industry.

After all, according to the *Space Report 2011*, the space economy continued to grow for the fifth year in a row, unaffected by the global economic turmoil. The space economy increased by 7.7% in 2010, registering a robust growth rate compared with the average of 5% per annum registered in the previous two years.

The space economy itself increased by about $20 billion to reach an estimated total of $276.52 billion, the report said. Pertinently, the report said, "Some of this growth came from increases in government spending, but the vast majority occurred in the commercial sector."

While sectors such as telecom may be driving some of this, many of the noticeable activities in the sector are coming from private individuals and corporations. From space tourism to next-generation launch vehicles, almost in every sphere private investments are fast emerging.

So, India can't afford to scare off entrepreneurs. But that's what the Antrix-Devas deal has done.

Antrix and Devas

Antrix (a variation of the Hindi word for space, *antariksh*) Corporation was set up as the marketing arm of Isro in 1992. The company hoped to promote commercial exploitation of space products, technical consultancy services and transfer of technologies developed by Isro. And most importantly, as Isro said about the Devas deal: "A major objective is to facilitate development of space-related industrial capabilities in India."

Enter Forge Advisors, a US-based strategic consultancy. In March 2003, Antrix inked a memorandum of understanding with Forge for exploring opportunities in digital multimedia services. Forge later established an Indian company called Devas Multimedia, with some former Isro scientists on board.

On December 24, 2004, Antrix's board approved the draft agreement between the two sides, and the agreement was signed on January 28, 2005. The agreement provided leasing of 90% of the space segment capacity on two satellites for 12 years to Devas.

Two Satellites

An up-front capacity reservation fee of $20 million per satellite and annual lease charges starting at $9 million per satellite was to be paid by Devas to Antrix. Thus over 12 years, Devas would have ended up paying $300 million to Antrix.

Antrix committed to build and launch two satellites – Primary Satellite-1 and Primary Satellite-2.

These two would have helped Devas deliver a range of services such as broadband to remote areas. The Cabinet approved the building of both satellites.

Scam or No Scam?

So far, so simple. But here's how a "scam" was discovered: first, the Cabinet was not "informed" that the two satellites were being built by Isro for Devas. Second, there was no tendering for awarding the contract to Devas. Third, the satellites were leased to Devas at "throwaway" prices. There are powerful counter arguments. First, Devas was bringing in new technology that had a high risk of failure. Second, Antrix/Isro, regularly leases satellite capacity to private firms in the direct-to-home business without tendering. Third, the estimated loss – media reports said ₹2 lakh crore – was based on comparing what Devas paid to 3G auction prices. That's a nonsensical comparison because the 3G spectrum and its uses and market are completely different from those of the S-band spectrum and the related technology that Devas would have used.

But the damage was done. A hi-tech, high-risk technology venture that was bringing in private and foreign capital to space business in India was killed. "It was reported [by the media] in a very bad fashion," says Ajey Lele of the Institute for Defence Studies and Analyses.

Antrix, which was supposed to be the government space technology arm that would bring in private investment and cutting-edge technology and market Indian space capabilities abroad, remains very badly damaged.

The Antrix Remit

Given these circumstances, it is hardly surprising that the order to bar the scientists from any kind of government employment has not gone down well with the country's scientific community.

Leading the charge against the government action was none other than the chairman of the Scientific Advisory Council to the Prime Minister, CNR Rao. Several other prominent scientists joined Rao in criticising the government. Roddam Narasimha, who investigated the deal along with former cabinet secretary BK Chaturvedi, wrote to the prime minister saying the action was unjustified.

The decision also goes against the very rationale behind the creation of Antrix: to encourage private-sector participation.

KR Sridhara Murthy, former managing director of Antrix, who was among the four space scientists blacklisted by the government, says Antrix revenues have been steadily rising and it had a good strategy in place. "Our thinking when we started Antrix was developing infrastructure and promoting private-sector participation," Murthy said. A former Antrix official said, on the condition of anonymity, that space services are "high-risk, high-returns" sector and the S-band deal broadly fit into this vision. "Devas was to share the risk since the technology they were planning to bring in was yet to be implemented in the market."

Isro's Budget... *... is peanuts compared with*

$0.9bn (₹4,880 cr) Revised Estimates in 2010-11

$64.36 bn US Space Budget

$1.3 bn China's Space Budget

Business Blacklisted

The decision to blacklist the scientists will kill entrepreneurial spirit and risk-taking in the scientific community, say scientists. Admits an Isro scientist, "If you keep aside the issue of legality and ethics, what the controversy tells me is that you better behave like a bureaucrat. No risks, no unwanted heroisms."

And many people familiar with how the government works are pointing to an anomaly: the Antrix related blacklisting is harsher than how the government treats blacklisted defence firms.

The latter are allowed to participate in competitive tenders, though with some riders. And this, when there's prima facie evidence of kickbacks paid by these firms to Indian officials. No kickbacks have been alleged in the Antrix controversy.

A former Antrix board member, who did not wish to be identified, said, "I am not for a moment suggesting that there should not be checks and balances, but we need to have an environment where risks and experiments are encouraged, and new technologies are appreciated. Otherwise our hope of emerging as a major space power may just remain a dream."

Space Merchants

Here's what entrepreneurs can do to space business. In December 2010, SpaceX, a California-based startup owned by Elon Musk (he had started PayPal earlier), launched a space capsule. SpaceX may launch its first manned space flight in a couple of years – the government monopoly worldwide on manned space flights will end.

There are others like SpaceX. Dream Chaser, Blue Origin (funded by Amazon.com founder Jeff Bezos), United Launch Alliance, and already established giants like Boeing and Lockheed Martin are all showing how private enterprise can redefine the space business.

Significantly, Nasa, America's government space agency, has been actively involved in encouraging these private sector enterprises through its Commercial Crew Development programme.

The scaring off of entrepreneurial ventures in Indian space industry is even more unfortunate because India has a huge cost advantage – Antrix offers to launch small satellites weighing less than 200 kg for less than $20 million. That's between 15% and 30% cheaper than American and European launch services. Similar cost advantages are there in other space services.

Space Startups

However, Antrix is a corporation with just over ₹1,000 crore turnover. And Isro's spends are also small by global comparisons (*see Isro's budget*).

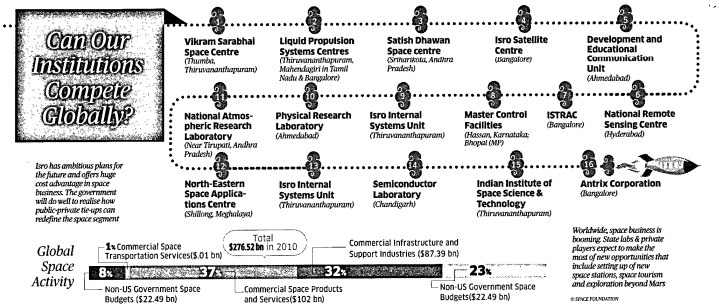
Lele said that the Centre needs to look at greater public-private sector tie-ups to boost investment. "The government needs to further expand the talent pool. Today space is a multidisciplinary sector, and it needs to bring in more professionals into the segment," he added.

Isro has ambitious plans for the future: unmanned missions to Moon, Mars and solar systems, developing new launch vehicles and spacecrafts. There's no way, space experts say, Isro can get there without private sector capital, technology and entrepreneurial talent. They also say the Antrix-Devas controversy is likely to have a lasting effect – especially for foreign investors in space ventures.

"We have to create a system where we cater for risks. That is important for start-ups. And a system where we attract investors," says a senior Isro scientist who didn't want to be named.

As of now, with senior space scientists and the government engaged in a bitter battle of accusations and a hi-tech entrepreneurial space venture dumped for what many say are invalid grounds, space startups look as distant as the Moon. ■

The author is senior editor, The Times of India



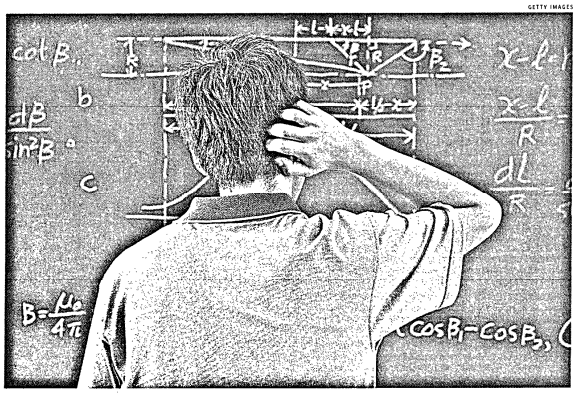
Scaring off entrepreneurs will hit India's cost advantage. Antrix offers are 15-30% cheaper than competitors

Economic Times ND 05/02/2012 P-24-25

For India, Math Talent is Not Adding Up

World-class mathematicians are in short supply, and the effect is felt in Indian R&D work. Hope now rests on newish institutes that are attracting bright young students

GETTY IMAGES



:: Hari Pulakkat

In 2008, software company Infosys established a prize for outstanding mathematical research in India. It went to Manindra Aggarwal, a computer scientist at the Indian Institute of Technology (IIT) in Kanpur, who had developed a sophisticated algorithm to quickly check whether a number is prime or not. Theoretical computer science and mathematics have fuzzy borders between them. Aggarwal's work had solved a long-standing problem in mathematics.

Next year Infosys established the Infosys Science Foundation and expanded the awards to include the physical, social and biological sciences. For the mathematics prize the jury chose Ashok Sen, a brilliant physicist at the Harish Chandra Institute in Allahabad, who had made fundamental contributions to string theory. Theoretical physics and mathematics also have fuzzy boundaries in many areas, and the jury had no qualms about awarding the mathematics prize to an outstanding physicist. No one would have grudged Sen a prize, but not everyone was sure his work was in mathematics.

In 2010 the jury could find no such people across the intellectual borders. So they travelled all the way to California in the US. The Infosys mathematics prize in 2010 went to Chandrasekhar Khare, professor of mathematics at the University of California in Los Angeles. Khare had worked for some years at the Tata Institute of Fundamental Research (TIFR), and so he was not a pure foreign product. But the jury went to the US last year as well, awarding the prize to Kannan Soundararajan, professor of mathematics at Stanford University. Both Khare and Soundararajan are reputed number theorists.

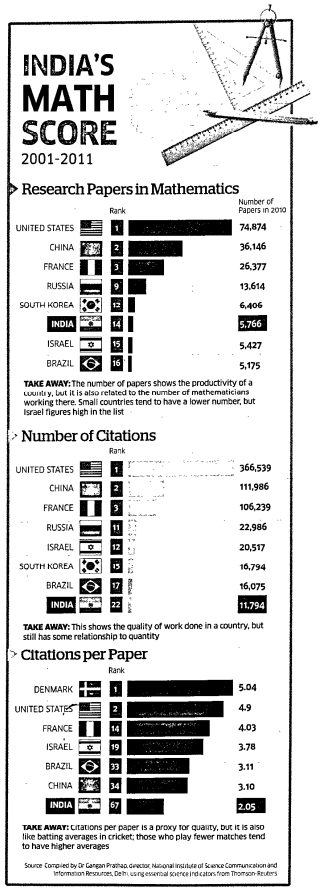
> *Brain drain has affected Indian mathematics considerably"*
> **MS Narasimhan,** distinguished associate at the Indian Institute of Science, Bangalore

No One to Give a Prize to

In four years of awards, the jury could not find a pure mathematician under the age of 50 working in an Indian institution for an award. "My standards are high," says the mathematics jury chair Srinivas Varadhan, professor of mathematics at the Courant Institute in New York. "I am not impressed by mathematics currently done here in India." The Infosys Science Foundation had set extraordinarily high standards of achievement as a condition for the award, and the jury would rather search for Indians abroad than lower their standards.

Varadhan is one of the most distinguished mathematicians in the world, having earned his PhD from the Indian Statistical Institute under CR Rao, arguably the finest living statistician. He had then moved to the famous Courant Institute where he became the director while making fundamental contributions to probability theory. He had won several prizes including the Abel Prize, sometimes described as the mathematician's Nobel Prize. The Indian government had honoured him with Padma Bhushan, and last year US president, Barack Obama, gave him the National Medal of Science, the highest honour bestowed on a scientist in the US.

Varadhan is probably the most well-known among a large number of contemporary mathematicians who had grown up in India but later moved to the US. They have made a big mark on the mathematics scene in the US, and they are now being joined by another set of Indian-origin mathematicians who have grown up in the US and are creating outstanding mathematics. And this happened while quality mathematics slowed down in the country, after a generation of fine post-independence mathematicians began to retire. "Brain drain has affected Indian mathematics considerably," says MS Narasimhan, distinguished associate at the Indian Institute of Science in Bangalore.

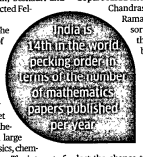


Steady Decline

When Narasimhan and many of his colleagues at TIFR were in their prime in the 1960s and 1970s, going abroad was not in the air. The best mathematicians flocked to the TIFR and the ISI and remained there through most of their careers. Rao worked in ISI for 40 years before retiring and moving to the US. Narasimhan, MS Raghunathan and CS Seshadri in TIFR were at one time known to be among the best mathematical minds in the world. Seshadri is now 80 and the others are in their late 70s. Subsequent generations of mathematicians did not quite reach this peak, and there is a general sense in the mathematical community that the subject has declined in India.

This fact is not easy to establish but there are indications that point to a decline. The opinion of the Infosys Prize jury is an indication and so is the absence of major prize winners in India. An Indian mathematician working in India is yet to win a major international mathematics prize like the Fields Medal, the Abel Prize or the Wolf Prize, the closest approach was made some time ago by the trio of Narasimhan, Seshadri and Raghunathan who were all elected Fellows of the Royal Society.

India is at the 14th place in the world pecking order in terms of the number of mathematics papers published in the past 10 years and 22nd in terms of citations in the same period. During the past decade, the Indian National Science Academy (INSA) has been struggling to get nominations for electing mathematics fellows, while it gets a large number of nominations for physics, chemistry and the biological sciences. The interest of Indian students in participating in the International Math Olympiad has been declining over the years. "We are concerned at the state of mathematics in India," says INSA president Krishan Lal.



Domino Effect

It may be easy to pick holes in this argument. Many brilliant mathematicians finish their careers without getting a major award. Mathematicians form a small community, and so it is relatively more difficult to find nominations for fellowships. Performance in the International Olympiad is not necessarily an indication of mathematical ability in a student. Mathematicians do not take citations in research papers as seriously as do the physicists and biologists. And so on. However, all these factors when combined tell one story: Mathematics in India has declined over the past three decades while Indian mathematicians performed extremely well abroad.

This decline has affected the development of science and technology in India. Large areas of mathematics go unrepresented in the country's research landscape, and Indian R&D organisations use few mathematicians when compared to those in the developed countries. One glaring omission is applied mathematics, which has rapidly expanded in recent decades and widely used in many areas of industry. "Applied mathematics is great fun," says Gadadhar Misra, professor of mathematics at the Indian Institute of Science (IISc), Bangalore. "But somehow mathematicians in India have not taken to this subject." Applied mathematics is now at the heart of subjects like biology, cryptography, economics, computer science and even the social sciences.

At the time of independence, despite the tremendous reputation of Srinivas Ramanujam, mathematics in India was not in a state of good health. This was partly due to absence of quality institutions for mathematics education and research, with the possible exception of ISI. This situation had led Harish Chandra, India's greatest modern mathematician (if you leave out Ramanujam), to leave the country in search of intellectual stimulation. Nehru had perceived the vacuum as much as anybody and had pushed senior scientists and mathematicians to start new institutions. This led to the founding of the TIFR mathematics department in the 1950s and the creation of some outstanding mathematics for about three decades.

US Beckons

Aspiring mathematicians of high calibre in India sought out the TIFR for their research career. By the 1970s, however, a curious phenomenon started showing up. High-quality mathematicians began to leave the country to work in the US, both from ISI and the TIFR. These included Varadhan, VS Varadarajan, VI Lakshmibai, Pavaman Murthy and others. This trend continued as a trickle in the 1980s, and in the past two decades more distinguished mathematicians left the country. They include Madhav Nori, Gopal Prasad and his brother Shrawan Kumar, Chandrashekhar Khare and Parimala Raman, all whom are now professors at leading US universities. In the 1970s, India also lost two brilliant young mathematicians, CP Ramanujam and Vijay Kumar Patodi, because of early death.

This effusion created a vacuum at the top in Indian mathematics, which also meant that a young generation of mathematicians who are now working in Indian institutions lost the chance to be trained by other distinguished mathematicians in the country. Beginning from the 1990s, however, India began to lose mathematicians at an even younger age. This list includes Sucharit Sarkar (now at Columbia University), L Mahadevan (at Harvard), and Kannan Soundararajan, who had left India for his undergraduate education in the US. The list would be longer if you include those who are applied mathematicians. "At that time there were no good institutions in India for undergraduate education in mathematics," says Soundararajan.

However, this story could have a happy ending. Like in the 1950s, when India created TIFR, the past two decades have seen the creation of a number of quality institutions. It includes the Chennai Mathematical Institute (CMI) and the Institute of Mathematical Sciences (IMS), both in Chennai, and the Harish Chandra Research Institute in Allahabad.

All the three institutions have attracted talent and have started producing good mathematics. The IISc has strengthened its mathematics department during the past decade, with the return of many mathematicians from the US. "There is instability if mathematics is confined to one institute," says Sed hadri, who had headed both the institutions in Chennai. "But new institutions have now started producing a strong middle class in mathematics." We will wait for the middle class to start producing the stars. ■

Times of India ND 05/02/2012 P-20


Corbis

Telepathy, it's here

Researchers in America use computer programme to hear word thought by patient

A first step has been taken towards hearing imagined speech using a form of electronic telepathy, it has been claimed. Scientists believe in future it may be possible to "decode" the thoughts of brain-damaged patients who cannot speak.

In a study described by one British expert as "remarkable", US researchers were able to reconstruct heard words from brain wave patterns.

A computer program was used to predict what spoken words volunteers had listened to by analysing their brain activity. Previous research has shown that imagined words activate similar brain areas as words that are actually uttered.

The hope is that imagined words can be uncovered by "reading" the brain waves they produce.

"This is huge for patients who have damage to their speech mechanisms because of a stroke or Lou Gehrig's disease and can't speak," said Professor Robert Knight, one of the researchers from the University of California at Berkeley. "If you could eventually reconstruct imagined conversations from brain activity, thousands of people could benefit."

However, the study involved the use of electrodes inserted through the skull on to the brains of epileptic patients.

A system sophisticated enough to achieve the same result non-invasively remains a long way off.

Prof Knight acknowledged that the research was at an early stage and controlling movement with brain activity was "relatively simple" compared with reconstructing language. But he added: "This experiment takes that earlier work to a whole new level."

The findings are reported in the online journal Public Library of Science Biology. Scientists enlisted the help of people undergoing brain surgery to investigate the cause of untreatable epileptic seizures.

Two different computational models were devised to match the spoken sounds to patterns of activity from the electrodes.

Patients then heard a single word, and the models were used to predict what it was from the earlier analysis.

The better of the two programmes reproduced a synthesised sound realistic enough for the scientists to guess the original word. THE INDEPENDENT

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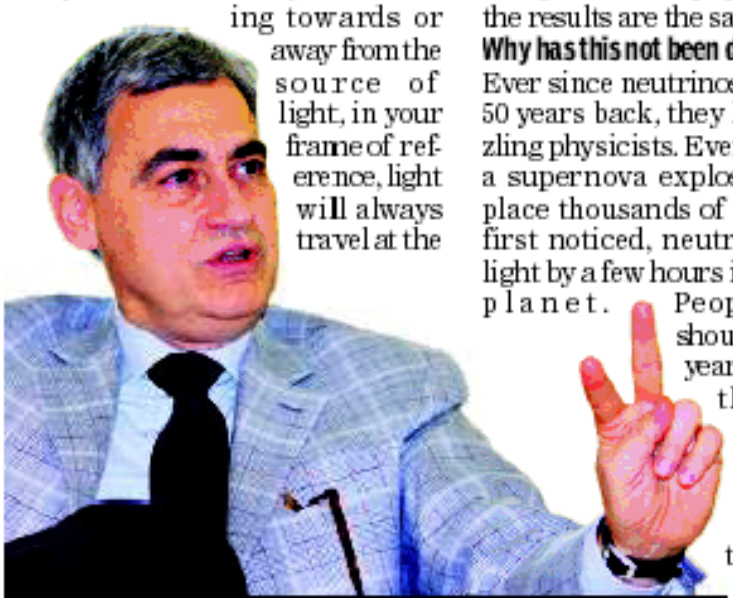
'I find Einstein close to the definition of God

Antonio Ereditato, professor of experimental particle physics at the University of Bern, Switzerland, is known for his proton collisions. But it is his experiment that detected faster-than-light neutrinos that could leave a wider impact

Atul Thakur | TNN

What's special about the speed of light?

Speed of light is a universal constant, touching many areas of physics. It relates space with time and matter with energy. According to Einstein's theory of special relativity, the speed of light is constant with reference to any inertial frame. That means that irrespective of whether you are moving towards or away from the source of light, in your frame of reference, light will always travel at the same speed. Also, it is the maximum speed at which matter and energy can travel in space.



Hasn't your discovery proved Einstein wrong?

I am the director of the Albert Einstein Center for Fundamental Physics. I find him close to the definition of God. Our results show that neutrinos did travel faster than light, but it has nothing to do with disproving Einstein. Firstly, it's a finding which points to an anomaly in the theory accepted so far. Secondly, it's not yet a discovery. Different physicists will perform the experiment using different equipments to see if the results are the same.

SUNDAY INTERVIEW

Why has this not been detected earlier?

Ever since neutrinos were detected 50 years back, they have been puzzling physicists. Even in 1987, when a supernova explosion that took place thousands of years ago was first noticed, neutrinos preceded light by a few hours in reaching our planet. People say they should have reached years before. Maybe they did, but there was nobody to detect them. There are also many theories which rubbish our results. I respect all of them but I don't acknowledge the use of theories to disapprove experiments. Science is defined on the basis of experimental result.

Did these neutrinos travel through extra dominations to become faster than light?

Richard Feynman (American physicist) once said, "I have approximate answers and possible beliefs in different degrees of certainty about different things, but I'm not absolutely sure of anything." I am a physicist. Religion believes and science doubts. There is no word like 'believe' in my dictionary. However, I can smell that theories about multiple dimensions might have merit.

Will the world change if your results get accepted by the scientific community?

I don't want to dream. We will be repeating the experiment in March with some changes. Scientists in the US and Japan will also be doing similar experiments. Within a few months to a few years, we'll know if we are right or wrong. If we are correct, then we can always accommodate Einstein's theory the way Newtonian mechanics was accommodated. We still use Newton's theories for certain planetary calculations. GPS, nuclear power, atom bombs and lasers will continue to work although they are based in relativity.