

WHY IS THERE NO NEW C.V. RAMAN?



“Why has there been no Nobel Laureate in science after C.V. Raman?” is a question Indian scientists are often confronted with from the general public. India has not produced a single Nobel Laureate in science since Sir C.V. Raman was awarded it in 1930 for “The Molecular Scattering of Light”. Ever since the first Nobel Prizes

were handed out in 1901, 791 Nobel Prizes have been awarded for scientific discoveries and inventions in physics, chemistry, physiology or medicine, economics, literature and peace, but India has been the recipient of only four awards, despite accounting for one-sixth of the world's population. Why we have not produced a single Nobel Laureate in science in the last seventy-five years despite increased spending on science and technology is a question to consider.

It is to be noted in this connection that the Nobel Prize is not awarded to honour an outstanding scientific career or achievement of a scientist. It honours a breakthrough or a specific performance which benefits mankind, and this is cited in the award. As a researcher and an inventor, Alfred Nobel himself was well aware of the essence of discovery and invention. Accordingly he set forth in his will that his fortune be used to endow “prizes to those who, during the preceding year, shall have conferred the greatest benefit on mankind.” In 1930, Sir C.V. Raman and Meghnad Saha were both nominated for the Nobel Prize for Physics but the award went to the former. Published reports of the Nobel Committee reveal that the Raman Effect was accepted as a more important discovery because of its perceived applications in the fields of physics and chemistry. Although Saha's scientific achievements were appreciated, they were not considered

worthy of the Nobel Prize. Saha's main discovery, the ‘thermal ionisation equation’, was seen as an application on astrophysical data. Similarly, the Committee considered his work on ‘selective radiation pressure’ not a new discovery but a logical consequence of his ionisation equation, and hence not a breakthrough accomplishment. By this criterion, India has been unable to produce a scientist since Raman whose path-breaking invention is worth even being CONSIDERED for the Nobel Prize.

Ironically, Nobel Laureate Raman and nominee Saha carried out their research in pre independent India when the opportunities for Indian scientists were very limited. Among the others who nearly missed the Nobel Prize in physics are Jagadis Chandra Bose, D.M. Bose, S.N. Bose and a few others. With IEEE's acceptance of J.C. Bose's pioneering experiments, the world now recognises that the true inventor of microwaves is Sir J. C. Bose and not Guglielmo Marconi, who was awarded the Nobel Prize in 1909. However, even less is known about the works of D.M. Bose, the nephew of Sir J.C. Bose, and Bibha Choudhuri, who identified a cosmic particle having average mass equals to 216 times the mass of electron (now known as mu-meson) between 1939-1942 while exposing a photographic film in Darjeeling. Instead, C.F. Powell was awarded the Nobel Prize in 1950 “for his development of the photographic method of studying nuclear processes and his discoveries regarding mesons made with this method.” Interestingly, Powell used exactly the same method of determining the mass of mesons but with improved photographic emulsion plates compared to those used by Bose. Powell, to his credit, admitted in his book, *The Study of Elementary Particles by the Photographic Method*, that the method developed by Bose and Choudhuri in 1941 to distinguish between tracks of proton and meson in an emulsion was indeed the first, and commented that “the physical basis of their method was correct and their work represent the first approach to the scattering method of determining momenta of charged

particles by observation of their tracks in emulsion." In this case, the lack of sophisticated scientific apparatus may have stood between Bose-Choudhuri and the Nobel Prize.

There is no doubt that creativity and devotion are two prime factors necessary for a scientific breakthrough. In pre-independent India, in particular, people entering research did so purely from their love of science—a passion so intense that they sometimes used their own money to conduct research instead of relying on Government funds. Of course, anyone who takes up research as a profession definitely loves science, but to what extent is the moot point. As Einstein once commented, "Many kinds of men devote themselves to science, and not all for the sake of science herself. There are some who come into her temple because it offers them the opportunity to display their particular talents. To this class of men science is a kind of sport in the practice of which they exult, just as an athlete exults in the exercise of his muscular prowess. There is another class of men who come into the temple to make an offering of their brain pulp in the hope of securing a profitable return. These men are scientists only by the chance of circumstance which offered itself when making a choice of career. If the attending circumstances have been different, they might have become politicians or captains of business." It is time to stand in front of a mirror and verify how correct or incorrect the above statement is.

It is often argued that our budget allocation for science and technology, as a percentage of GDP, makes it unlikely that India will earn a Nobel Prize in basic sciences anytime in the near future. While it is true that many of the research in experimental physics can no longer be done on a small budget, there are almost as many areas in theoretical physics which do not need a hefty infrastructural investment. In fact, an inspection of Nobel Prizes awarded in physics in the last fifty years reveals that about half of them were awarded to theoretical work. C.V. Raman earned his Nobel Prize performing experiments with equipment worth three hundred rupees, J.C. Bose spent his own money to conduct research, and Einstein did his phenomenal work in 1905 as a patent clerk in a government office without any financial support from anywhere.

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Indian scientists are by no means less intelligent than scientists of anywhere in the world. But what we lack is creativity, because all intelligent people are not creative, although the reverse is true. What is creativity? There is no simple answer and even the Nobel Laureates deliberate over the meaning of creativity. In a meeting to commemorate the centenary of the Nobel Prize, five Nobel Laureates and members of different selection committees of the Nobel Prize met to discuss how to foster creativity amongst the younger generation. Whether creativity can be 'created' is an open question. What was admitted is that creativity is the product of curiosity and independent

thinking. After all, there may have been hundreds of physicists who saw falling apples before Newton, or the blue sky before Raman. Reading biographies of Nobel Laureates gives us the impression that not all of them showed unusual talents while they were students.

It is also known that creativity can be encouraged or enthused. Influences of "external factors" such as family, society, teachers and parents are useful in fostering creativity in young children. Unfortunately, the

culture of creative and original thinking is sorely missing in the Orient, both during schooling and in research. Unlike the West's emphasis on individuality, we promote conformity, with the result that our students are discouraged from unconventional or independent thinking. Susumu Tonagawa, the Nobel Prize winner in Physiology and Medicine of 1987, highlights this phenomenon through an incident where an essay on slavery written by his son produced an animated discussion in his American school on the ethics of subjugation and the eventual abolishment of slavery. In his Japanese class however, which he attended over the weekends, his teachers would merely ask for the date when slaves were first brought to the United States in the hope of generating a single answer. It is this same emphasis on examination rather than creativity that often discourages original thinking—this was illustrated by India-born Fareed Zakaria, editor of *Newsweek International*, when he pointed out in a recent column that although Singapore is number one in the global science and mathematics rankings for school-children, the island nation "has few truly top-ranked scientists, entrepreneurs, inventors, business executives or academics."

In research too creativity is seldom encouraged. Research grants are, in many cases, offered to well-established research programmes instead of more uncommon or new ideas. Conventional wisdom, as propagated by fund-granting experts, is that it is safer to invest in a subject that will produce positive results. Being awarded grants in areas falling under "front area research" (read fashionable) defined by funding agencies is easier than on a new idea or concept. Fortunately for us, the above-mentioned Indian physicists did not have to undergo the drill of selection by experts.

It is interesting to look at which areas of scientific field India is relatively strong—a recent survey to quantify the relative impact of Indian science focused on twenty-one different fields of science. A country's influence was determined by the citations-per-page average of scientific papers from the country compared to the world average. The analysis revealed that between 1997 and 2001, there were 76970 papers listed in the Thomson-ISI database that had at least one author's address from India. While the impact of Indian physics, mathematics and material sciences was found to be about 35% below the world average (1.24 citations per paper for India, versus a world baseline of 1.97 cites), in fields like biology and biochemistry, India's contribution was 71% below the world average. While it is true that the numbers would improve if the contribution of Indian expatriates is taken into account, the exodus of bright scholars and researchers is again symptomatic of our narrow teaching tradition. Unless

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The government's decision to establish institutes like Institute of Science Education and Research (IISER) to catch talents at young age and groom them for research as a career is definitely a welcome move. It has been proved that mere increase of the amount of fellowships to research students and payscales for teachers and faculty have not produced the expected result. It is worrying to see when scientific research mostly transformed merely into another respectable job. What we need is to enthuse creativity, encourage independent thinking to the students and make them passionate in research. Devotion and dedication will follow automatically. As Einstein remarked about himself "I have no special talents, I am only passionately curious". It is to be seen how successful are the teachers in nurturing creativity

and how India's contribution to science in global scenario changes with time.

The question that was raised here is in a sense global. American scientists are asking the same question "Why there is no new Einstein?" An article entitled "Why no new Einstein?" has been reproduced in this issue with the permission from the American Institute of Physics. I hope readers will find many of the issues raised in this article are true for our country too.

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