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## Irreverence and Indian Science

NOBEL LAUREATE RICHARD FEYNMAN BELIEVED THAT CREATIVE PURSUIT IN SCIENCE REQUIRES irreverence. Sadly, this spirit is missing from Indian science today. As other nations pursue more innovative approaches to solving problems, India must free itself from a traditional attitude that condemns irreverence, so that it too can address local and global challenges and nurture future leaders in science. But how can the spirit of adventurism come to Indian science?

The situation has deep roots in Indian culture and tradition. The ancient Sanskrit saying “baba vakyam pramanam” means “the words of the elders are the ultimate truth,” thus condemning the type of irreverence inspired by the persistent questioning that is necessary for science. The Indian educational system, which is textbook-centered rather than student-centered, discourages inquisitive attitudes at an early age. Rigid unimaginative curricula and examinations based on single correct answers further cement intolerance for creativity. And the bureaucracy inherited from the time of British rule overrides meritocracy.

Every January, the Indian Science Congress is addressed by the current prime minister of India. In 2001, Prime Minister Vajpayee said, “For Indian science to flourish, the administration and government officials should serve as facilitators of science and not as masters of scientists.” In 2010, Prime Minister Singh lamented, “It is unfortunately true that red tape, political interference and lack of proper recognition of good work have all contributed to a regression in Indian science.” Alas, during the interim years, little had changed.

One might assume that innovative funding mechanisms would spur an adventurous spirit in Indian science. As director of the National Chemical Laboratory and director general of the Council of Scientific and Industrial Research, I launched a Kite Flying Fund and a New Idea Fund to support audacious ideas. Finding enough fundable ideas became a challenge in both cases. But Indian science has had its great rebels. In his book *The Scientist as Rebel*, Freeman Dyson writes, “For the great Indian physicists of this century, Raman, Bose, and Saha, science was a double rebellion, first against English domination and second against the fatalistic ethic of Hinduism.” Thus, the challenge now is to create a nurturing environment for creative irreverence within India.

The good news is that the environment is starting to change. India is experiencing a massive expansion in its higher educational system. Thirty new universities are being created. Additionally, five new Indian Institutes of Science Education and Research have just opened. These institutes are fostering a new culture of innovation through interactive learning methods, borderless course curricula, and new evaluation systems, in which even students participate in evaluating other students. Foreign companies have established 760 R&D centers that employ about 160,000 researchers, many of whom are Indian returnees from abroad who bring with them different innovation and work perspectives, while at the same time reversing the brain drain. The recent launch of Tata Nano, the world’s least expensive automobile, is considered to be a rare game-changer as a product of India. The spirit of adventurism embodied in Nano is being promoted across the Tata Group of diverse companies through an annual innovation competition, with a special award called Daring to Try, which recognizes those who pursue ambitious ideas that fail. Hopefully, this spirit will rub off onto other enterprises and institutions.

India must seize this emerging transformative opportunity by working hard to produce new organizational values and creating a tolerance for risk-taking and failure, while introducing funding mechanisms to support disruptive ideas. If India can thereby build the spirit of irreverence that Feynman endorsed, then surely Indian science will create many Ramans of the 21st century.

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