

NEWSMAKER INTERVIEW: C. N. R. RAO

Top Indian Chemist Helps Make the Case for Science Windfall

BANGALORE, INDIA—At the Indian Science Congress last week, Prime Minister Manmohan Singh surprised his audience with a promise to more than double central government R&D spending from \$3 billion in 2011 to \$8 billion by 2017. If the windfall appears in India's next 5-year plan, expected to be released in March or April, credit Singh's science advisory council. In a report to Singh last month, the panel, chaired by eminent chemist C. N. R. Rao, warned that Indian laboratories are rife with mediocrity and its universities are in decay. Worried that India's scientific community is losing ground to China and other nations, the council urged Singh to take "steps in a warlike fashion," including dispatching hundreds of students abroad for training and creating centers of excellence around top-shelf investigators.

Singh's embrace of science comes at a critical juncture for India, says Rao, Singh's science adviser. With 45 books and more than 1500 research papers to his name, India's most-cited scientist's latest fascination here at the Jawaharlal Nehru Centre for Advanced Scientific Research is the wonder-material graphene. In an interview with *Science*, Rao, 77, bemoaned the deterioration of India's academic institutions and its tendency to steer talented individuals into information technology. He also worried that scientists are losing ground to activists. For instance, Rao pointed to a decision in 2010 by India's environment minister to reject a scientific panel's advice and ban commercialization of what would have been the country's first genetically modified food crop: varieties of eggplant, called brinjal in India, equipped with a protein from the bacterium *Bacillus thuringiensis* (Bt) that's toxic to insect pests. The following comments have been edited for clarity and brevity. —PALLAVA BAGLA

Q: Is there a crisis in Indian science?

C.N.R.R.: There are serious concerns. In any given area of science or engineering, the number of experts is rather small in India. The other day somebody asked, "How many people work in graphene?" I thought, "We have enough people." We found only five or six.

We have been short of high-level talent for some time, and we are also short of leaders. The crisis we are facing is how to cre-



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ate a large, measurable, sizable, or critical mass of very capable scientists in different areas. India is the biggest supplier of technocoolies for the information technology industry but produces only 25 Ph.D.s in computer science. What an irony!

Q: Is India's bureaucracy killing science?

C.N.R.R.: Oh yeah, partly. Suppose you are the head of an institution and we want to give you another 3-year term. The procedure is so terrible. It will take 1 year! That is not how science is done. People should be treated better as individuals, and you can demand results if you have treated them well.

I don't think a professor in a university in any state in India has the freedom even to think properly because he is completely cowed by the atmosphere.

Q: Is India obsessed with big science and funding space and nuclear research?

C.N.R.R.: This obsession we have with big science, I am a bit unhappy about that. Science is not just atomic energy, science is not just space. Real science is done in small laboratories.

Q: India is looking at a mission to Mars and sending humans to the moon. Is this the thrust India should have?

C.N.R.R.: I am more worried about people on Earth. I am a very simple-minded person. There is so much to be done for this country in terms of infectious diseases and other social and living conditions.

Q: Why hasn't an Indian won a science Nobel since C. V. Raman's physics prize in 1930?

C.N.R.R.: I don't see any potential Nobel laureates in most subjects in India. Maybe we should create new opportunities for young people to perform in such a way that they become potential Nobel laureates.

Q: What does one need to succeed as a scientist in India?

C.N.R.R.: Stamina, tenacity, doggedness, and perseverance. Also a little intelligence is useful.

Q: In the past 1 or 2 years, the general feeling I am getting is that respect for science in India has gone down.

C.N.R.R.: Yes. We have to be very sure to educate our young people much better. Otherwise, the rabble-rousers and social activists will mislead the country. This is where the government has to also show maturity by taking proper scientific advice.

Q: You are talking about Bt brinjal [a genetically modified eggplant]?

C.N.R.R.: Bt brinjal was only the starting point; they will eventually take a decision which is based on either so-called popular opinion or opinion that goes along with the feelings of certain groups of people. Politics should never enter this kind of decision-making; unfortunately, it does. All over the world it does, but in India it is much more so. Being a democracy, there will be several views. That may be a problem.

Q: Colleagues say you still have a childlike excitement about science.

C.N.R.R.: I love it. Science is like that. If you are not childlike, you cannot be a scientist.

Q: Do you have any regrets over having never left India for a position abroad?

C.N.R.R.: I have suffered, I have agonized, but have no regrets.

Q: Any big message for India?

C.N.R.R.: I wish in 20 years India will be in the top three or four countries in the world in science. I really want to see India shine.