

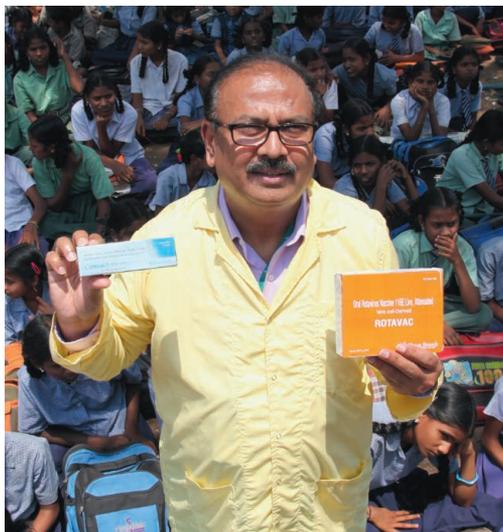
and the company anchored a high-tech enclave in Hyderabad that Krishna christened “Genome Valley.”

The company stumbled in September 2011, when the World Health Organization, in an audit of Bharat Biotech’s production plant in Hyderabad, found “deficiencies in the implementation of good manufacturing practices and in the quality management system of the company,” WHO said in a statement that December. WHO, which noted that Bharat Biotech’s vaccines on the market were deemed safe, asked for the audit in response to the company’s applications to include two vaccines on a roster of products approved by WHO for bulk purchase by the U.N. Children’s Fund and other U.N. agencies. Ella insists that the problem is merely about documentation and that quality was never an issue. Company officials are in discussions now with WHO on getting their firm approved as an authorized vaccine supplier.

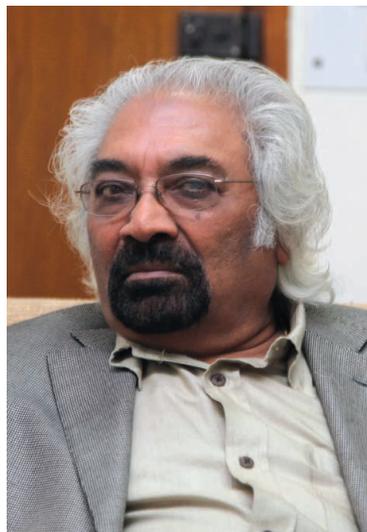
In the meantime, Bharat Biotech achieved a milestone earlier this month

when the Indian government announced that the company’s homegrown vaccine against rotavirus had scored high marks in clinical trials. In the United States, the virus is a public health nuisance, causing severe diarrhea in infants and young children, but few

At a press conference in New Delhi earlier this month, K. Vijayraghavan, secretary of the Department of Biotechnology, announced that ROTAVAC, Bharat Biotech’s vaccine against the predominant rotavirus strain circulating in India, had compiled an



Mass appeal. Bharat Biotech, led by Krishna Ella (left), has made cheap vaccines a profitable venture. Indian telecom pioneer Sam Pitroda (right) believes scientists have a moral responsibility to help the poor.



“excellent safety and efficacy profile” in phase III clinical trials—the first time such trials were conducted in India for any vaccine. In a statement, Anthony S. Fauci, director of the National Institute of Allergy and Infectious Diseases (NIAID) in Bethesda, Maryland, hailed the results as “a significant victory for India’s scientific community.” (A partner in the collaboration, NIAID provided one of the strains tested in the ROTAVAC trial.)

deaths. In India, rotavirus is a menace that easily spreads through contaminated food and water. It infects some 20 million children in India every year, claiming more than 100,000 lives. Most of those deaths are preventable—children become dehydrated and fail to receive adequate treatment.

This effort originated at the All India Institute of Medical Sciences in New Delhi, where Maharaj Kishan Bhan, a vaccine researcher, in 1985 identified a nonpathogenic strain of rotavirus. Thirteen years later, the Indo-U.S. Vaccine Action Program selected Bharat Biotech to develop the vaccine. Since then,

A Role for Science in Poverty Alleviation?

NEW DELHI—With more than 400 million people in India earning less than \$1.25 a day, poverty reduction in this sprawling nation is an urgent task. Perhaps that’s why the ruling United Progressive Alliance turned to one of its deep thinkers to tackle the intransigent problem. In July 2011, Jairam Ramesh was tapped to lead the Ministry of Rural Development, an \$18 billion agency focused on the plight of the 70% of India’s 1.2 billion people who live in the countryside.

Ramesh, 59, is no stranger to India’s scientific community. He garnered headlines in January 2010, when, as environment minister, he imposed an indefinite moratorium on the introduction of genetically modified eggplant (*Science*, 12 February 2010, p. 767). A mechanical engineer by training who’s known for his wit and biting remarks, Ramesh is also a China expert; in 2005 he published a book on the relationship between the two Asian powers, *Making Sense of Chindia: Reflections on China and India*.

Last month, *Science* spoke with Ramesh in his office here about the role of science in poverty alleviation. His remarks were edited for brevity and clarity.



Reaching out. Jairam Ramesh’s main task now is helping rural poor.

Q: Is science in India helping the poor?

J.R.: People are coming out of poverty because of agricultural growth, better wages, and better infrastructure. Science played an important role in creating new varieties of rice and wheat; that has lifted farmers out of poverty. Science has created mobile phones that are giving farmers and wage seekers links with markets. But if you are asking me if there is a direct relationship between investment in science in India and rural development, my answer is no.

Q: How would you get scientists more involved in poverty alleviation?

J.R.: Almost 60% of all open defecations in the world are in India. And open defecation and poor sanitation has a direct link with malnutrition and stunted growth. But we’ve had no innovation whatsoever in the field of toilets. So when Mr. Bill Gates came to meet me a couple of months ago, we said, why don’t we collaborate together and have a global challenge? Challenge the world’s inventors to come up with low-cost toilets for use in trains, for use in our homes. You take four or five crucial areas and certainly you can throw the market open for ideas.

—P. B. AND R. S.

the Indian government and foreign partners, including the Bill & Melinda Gates Foundation, have poured about \$100 million into the project. ROTAVAC is expected to be on the market in early 2014, priced at about \$1 per oral dose for a three-dose series. Two Western-manufactured vaccines now on the market in India each cost about \$40 per dose.

Toward total inclusion

In his 2008 book *Imagining India*, Nandan Nilekani, a tycoon who co-founded the Bangalore-based software and information technology giant Infosys in 1981, made an intriguing proposition. Biometrics technology had become reliable and cheap enough to deploy nationwide in India; Nilekani proposed entering people living below the poverty line into a database that would help them access benefits. “Millions of people become adults in India without an identity document,” and they are unable to tap into the country’s welfare system, Nilekani says. “We had to find a way to make society more inclusive.” Toward this end, he argued, biometrics could be a powerful tool.

Prime Minister Singh threw his weight behind the venture, and in July 2009 the Unique Identification Authority of India (UIDAI) was formed. Its ambitions have since grown: UIDAI is now striving to assign a random 12-digit “Aadhaar” ID number to every resident of India, based on photos, iris scans, and a full set of 10 fingerprints. Some critics blast the program as



Biometrics with benefits. A boy in New Delhi gets his thumbs scanned for an Aadhaar ID number.

far too ambitious to succeed. Others say it feels like Big Brother; they point out that security agents will have access to the database. Nevertheless, 300 million people have received Aadhaar numbers since the authority’s enrollment centers, scattered across the country, opened in September 2010.

The system’s *raison d’être* is authentication: Biometrics offers a simple and more reliable way to verify a person’s identity. With corporate partners, UIDAI is now rolling out a micro-ATM system in which

welfare payments and other government benefits are directly paid into the ID holder’s account, rather than getting routed through leaky and often corruption-ridden government channels. Beneficiaries will be able to receive their payments at shops equipped with fingerprint or iris scanners. And students may be required to have Aadhaar numbers when sitting for nationwide tests.

Nationwide connectivity is transforming India in other ways as well. Today, the country has 900 million cell phones. “Only about 35% of Indian homes have toilets. About 60% have mobile phones,” says Jairam Ramesh, who as India’s minister for rural development is searching for innovative solutions for poverty alleviation (see p. 1034).

Text messaging services now alert farmers to prevailing market prices, enabling them to decide how and where to sell commodities before leaving the farm. In the past, they would have to lug their wares to a market and hope for the best. Fishers, too, are reaping the benefits of technology. Using data gathered by its satellite fleet, the Indian Space Research Organisation maps plankton-rich zones within 20 nautical miles of India’s coast where fish are likely to congregate. It then feeds daily fishing forecasts, as well as wave height and other data, to Village Resource Centers pioneered by the M. S. Swaminathan Research Foundation (MSSRF) here. “We’re getting a lot of feedback from fisher folk,” says MSSRF information specialist Nancy J. Anabel. “Now

Q: Why is poverty so entrenched in India?

J.R.: It has nothing to do with science. It is the failure of land reform. We have not ensured equal access to land. We’ve had a horrendously iniquitous caste system, which is still very much prevalent in our country. Public health successes in India have reduced mortality rates drastically, but we’ve had a tripling of our population since independence. So the causes of poverty are complex, and the causes of poverty are not linked to the availability or non-availability of science and technology.

One shouldn’t make the mistake of giving science and technology more power than it actually has to alleviate poverty. Sure, it has a place to reduce drudgery, for example, if you can develop improved cookstoves. But how do you disseminate 150 million cookstoves?

Q: What about a McDonald’s of cookstoves?

J.R.: McDonaldization has taken place in a few areas. Mobile telephones are the most ubiquitous instrument of rural transformation today. But in other areas, we have not been very successful. Cookstoves is a classic example. We’ve been at this cookstove game for almost 40 years. But whether improved stoves have actually penetrated rural households, I find no convincing answer.

Q: Will the universal ID (see p. 1032) make a major difference?

J.R.: It is a very big technological intervention that will have a major

transformative effect in rural areas. All pension payments will be delivered electronically to the doorstep of the beneficiaries.

Q: How long will it take for everyone in India to have a universal ID?

J.R.: It is a huge priority issue. We hope that by the end of 2014, all subsidy payments, whether it is a kerosene subsidy or cooking gas or whatever subsidy, will be through this route, through micro-ATMs.

Q: So you need 600,000 micro-ATM machines, one for every village?

J.R.: At least. From a rural point of view, this is a game changer. It gives you a channel for delivery: cash benefits in a relatively hassle-free environment.

Q: India helped find water on the moon. But it struggles to provide clean drinking water to its people. Why?

J.R.: Water is a good example of where science is coming to our rescue. In 1987, there were about 50,000 villages in India without drinking water sources. Satellites helped locate sources for these villages within 1.5 kilometers. This was one of the earliest examples of a quick win for science in rural development.

I am not a worshipper of science. I realize the potential of science and the power of science. But I also realize that there is more to life than science itself. And the constraints to the diffusion of knowledge, the societal barriers, those have to be addressed.

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