CONTACT SCIENCE

Letters to the Editor
May be submitted via e-mail (at science_letters @aaas.org), fax (202-789-4669), or regular mail (*Science*, 1200 New York Avenue, NW, Washington, DC 20005, USA). Letters are not routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for clarity or space. They may appear in print and/or on the Internet. Letter writers are not consulted before publication.

Subscription Services
For change of address, missing issues, new orders and renewals, and payment questions, please contact AAAS at Danbury, CT: 800-731-4939 or Washington, DC: 202-326-6417, FAX 202-842-1065. Mailing addresses: AAAS, P.O. Box 1811, Danbury, CT 06813 or AAAS Member Services, 1200 New York Avenue, NW, Washington, DC 20005 • Other AAAS Programs: 202-326-6400

Member Benefit Contacts
For Credit Card: MBNA 1-800-847-7378; Car Rentals: Hertz 1-800-654-2200 CDP#343457, Dollar 1-800-800-4000 #AA1115; AAAS Travels: Betchart Expeditions 1-800-252-4910; Life Insurance: Seabury & Smith 1-800-424-9883; Other Benefits: AAAS Member Services 1-202-326-6417.

Reprints
Ordering/Billing/Status 800-407-9190; **Corrections** 202-326-6501 **Permissions** 202-326-7074, FAX 202-682-0816

Internet Addresses
science_editors@aaas.org (for general editorial queries); science_news@aaas.org (for news queries); science_letters@aaas.org (for letters to the editor); science_reviews@aaas.org (for returning manuscript reviews); science_bookrevs@aaas.org (for book review queries); science@science-int.co.uk (for the Europe Office); membership@aaas.org (for member services); science_classifieds@aaas.org (for submitting classified advertisements); science_advertising@aaas.org (for product advertising)

Information for Contributors
See pages 99 and 100 of the 1 January 1999 issue or access www.sciencemag.org/misc/con-info.shtml.

Editorial & News Contacts
North America 1200 New York Avenue, NW, Washington, DC 20005 Editorial: 202-326-6501, FAX 202-289-7562 News: 202-326-6500, FAX 202-371-9227 • Bureaus: Berkeley, CA: 510-652-0302, FAX 510-652-1867, San Diego, CA: 760-942-3252, FAX 760-942-4979, Chicago, IL: 312-360-1227, FAX 312-360-0537, Pacific Northwest: 541-342-6290
Europe Headquarters: Bateman House, 82-88 Hills Road, Cambridge, UK CB2 1LQ; (44) 1223-326500, FAX (44) 1223-326501 Paris Correspondent: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00
Asia News Bureau: Dennis Normile, (81) 3-3335-9925, FAX (81) 3-3335-4898; dnormile@twics.com • Japan Office: Asca Corporation, Eiko Ishioka, Fusako Tamura, 1-8-13, Hirano-cho, Chuo-ku, Osaka-shi, Osaka, 541 Japan; (81) 6-202-6272, FAX (81) 6-202-6271; asca@os.gulf.or.jp • China Office: Hao Xin, (86) 10-6255-9478; science@public3.bta.net.cn • India correspondent: Pallava Bagla, (91) 11-271-2896; pbagla@ndb.vsnl.net.in

Science in the Future of India

C. N. R. Rao

As a developing nation, India faces a situation that may be unique among democratic countries in recent human history. On the one hand, it is committed to taking care of the minimum needs of a huge and rapidly growing population. On the other, it must compete with the most advanced countries in a global economy. Unfortunately, it is becoming increasingly difficult for Indian researchers who work at the cutting edge of science and technology to do their jobs well because of the poor infrastructure and facilities at most institutions, in particular the universities. As a result, the gap in the level of science and technology between the advanced countries and India is increasing.

Why is that the case? There are several reasons. A disquieting tendency in India and in many of the developing countries is the increasing disinterest in science among the younger generation. Many colleges are closing down science departments because students prefer to take courses in management, commerce, and related areas. And there are fewer bright students studying for careers in science and engineering research or higher education. This situation has to be remedied by promoting talent and by offering incentives. It is likely that the vast population of India and other developing countries harbors more than a few geniuses, possibly future Faradays and Newtons. But we have to find them and encourage them to pursue science.

"India...has to develop its own expertise at the highest level...."

The situation facing universities is quite depressing because of deteriorating facilities, poor administration, vested interests, and overemphasis on examinations rather than education. Although institutions that provide a proper environment and facilities continue to attract young scientists in spite of modest salaries, they are negligible in number. There has also been a downward trend in basic research in the past few years. India will face a no-win situation unless there is a radical structural transformation of the system. Oppressive administrative practices, political interference, and personal animosities tend to impede creativity and innovation, as in most other developing countries. The bureaucratic procedures that run the country have hardly changed from the days of British rule. They are the same cumbersome institutions for science, revenue service, and municipal administration. The labyrinths in the government buildings, and the mountains of files piled high within them, make one shudder. It takes 2 years or more to obtain a grant, and government departments are generally not responsive to scientists, especially those of the younger generation.

In spite of major gains and accomplishments, India remains poor and backward, with innumerable problems and challenges fueled by its burgeoning population. Science has much to contribute toward creating a nation that is economically sound and where social justice prevails. Because science has become a key component of communication in the world at large, a nation unable to speak the language of science cannot adequately deal with other nations in matters of vital interest. It has therefore become incumbent on even the smallest or the poorest of nations to have an optimal science base and the associated institutional structure. A majority of the population in India has yet to become literate and develop the scientific awareness needed to face new and difficult situations. Scientific literacy is equally needed among the educated citizens, including politicians and administrators.

To achieve these goals, pragmatic efforts are essential on several different fronts. First and foremost is the need to carry out programs in science and technology that focus on the minimum basic needs of the common person and on the promotion of sustainable development, which will provide meaningful employment, particularly in rural areas. The country also must develop an adequate infrastructure for energy, transportation, and communications. A large country such as India faces an additional challenge. It has to develop its own expertise at the highest level, at least in a few chosen areas of science and technology, so as to be able to compete and excel in the international arena. India has to invest much more in education [6% of gross domestic product (GDP) rather than the current level of around 3%] and in science (about 2% of GDP rather than 0.9%). It is only by making use of a strong knowledge base that India can ever hope to become a great nation.

C. N. R. Rao, a professor of chemistry, is president-elect of the Third World Academy of Sciences.