to function as a pace-setting institution for promoting excellence in Scientific and Technological Research. The HRD Ministry will naturally finance the establishment of CRUST, but its running/recurring expenses can easily be raised through registration, course and examination fees.

Located at *New Delhi* and working closely with the *University Grants Commission* and the *Indian National Science Academy*, CRUST may be administered by a Board of Governors with the following illustrative list of members: – Vice Chancellor, CRUST (Chairman); Nominee of President, INSA; Nominee of President, INAE; Nominee of Chairman, UGC; Nominee of Chairman, AICTE; Nominee of Director-General, CSIR; Nominee of Director-General, ICAR; Nominee of Director-General, ICMR; Nominee of Director-General, DRDO; Nominee of Department of Science & Technology (DST); Nominee of Department of Atomic Energy (DAE); Nominee of Department of Space (DOS); Nominee of Finance Ministry; Pro-Vice-Chancellor, CRUST, Registrar, CRUST (Non-Member Secretary).

The Research Council of CRUST will be made up of distinguished scientists and technologists representing different subjects including those nominated by the Board of Governors as Chairmen of the corresponding Subject Committees for three-year periods as in the following illustrative list of members: – (1) Vice-Chancellor, CRUST (Chairman); (2) Pro-Vice-Chancellor, CRUST (Vice-Chairman); (3) Chairman, Committee on Physical Sciences; (4) Chairman, Committee on Chemical Sciences; (5) Chairman, Committee on Mathematical Sciences; (6) Chairman, Committee on Earth Sciences; (7) Chairman, Committee on Plant Sciences; (8) Chairman, Committee on Animal Sciences; (9) Chairman, Committee on Bio-Sciences & Technology; (10) Chairman, Committee on Agricultural Sciences & Technology; (11) Chairman, Committee on Medical Sciences & Technology; (12) Chairman, Committee on Constructional Engineering & Technology; (13) Chairman, Committee on Mechanical Engineering & Technology; (14) Chairman, Committee on Electrical Engineering & Technology; (15) Chairman, Committee on Chemical Engineering & Technology; (16) Chairman, Committee on Materials Engineering & Technology; (17–20) Four experts nominated by the Board of Governors from among Directors of National Level Laboratories; (21) Registrar, CRUST (Non-Member Secretary).

The Subject Committees may each have not less than five and not more than nine members, including the Chairmen, all to be nominated for three-year periods by a Nominating Committee made up of Vice-Chancellor, CRUST, as Chairman & Convener and with the Pro-Vice-Chancellor, CRUST and Chairman of the concerned Subject Committee as Members.

While framing CRUST's Act/Statutes/Rules/Regulations so as to maintain the highest standards in research, the following points may be kept in view:

1. Registration for Ph D of CRUST should be easy and possible any time of the year on payment of the concerned fees and fulfillment of necessary prerequisites.
2. Any Scientist/Technologist associated with the Board of Governors/Subject Committee of CRUST should hold the Ph D or equivalent degree of a recognised University and also be a Fellow of one of the Indian Science/Engineering/Medical Academies. Such a person may well be a retired Professor or Scientist, eminent in his field and still active in research
3. Only Ph D degree holders with sufficient research experience shall be recognised as Ph D supervisors from R&D Establishments and these may be conferred ADJUNCT FACULTY POSITIONS in CRUST on a contract basis with nominal honorarium, provided he or she has guided at least *one* Research Student/Fellow for the Ph D of CRUST.
4. CRUST shall ensure that certain minimum standards are maintained by concerned R&D Establishments as regards emoluments, living and working conditions, laboratory, library and computer facilities etc. for the Ph D registrants.
5 Quick, efficient and courteous with all concerned in its dealings, CRUST shall ensure monitoring of progress in research and examinations of Ph D theses without undue delay and due understanding of the human angle in the whole process.
6 Based on examiners' reports, Ph D theses of exceptional quality should be rewarded.

In conclusion, it needs to be stressed that this proposal has nothing to do with the numerous existing *degree-conferring* institutions of our country viz., Universities, Deemed Universities and Institutions of National Importance Its main thrust is towards assistance and guidance to hundreds of young Indian scientists and technologists who are eager to work for their Doctorate degrees, but find many hurdles in their way to the goal because of their association with *non-degree conferring* R&D Institutions, Laboratories or Centres.

T R. Anantharaman is in the National Physical Laboratory, New Delhi 110 012, India

Science communication – A proposal for action

D. Balasubramanian

Pandit Jawaharlal Nehru had a keen appreciation of science and its role in nation building; amongst those who have led free India he had it in the greatest measure, he upheld it and lived by it. It is indeed paradoxical that a generation later, when we apply science, technology, agriculture and medicine in Indian life more than ever before, those subjects are treated with benign (occasionally not so benign) neglect by the media, the legislators and the government. The science magazines *Science Today* and *Vigyan* have folded No news magazine of repute, be it in

English or in Indian languages, covers any science at all excepting scandals and squabbles involving scientists. Among the national newspapers, the *Science Express* supplement has been discontinued, and it is the Wednesday S&T Supplement of *The Hindu* that carries on, gratifyingly, as the lone sentinel. The daily from Hyderabad, *Newstime*, carries a weekly science page as does *The Pioneer* from Delhi, and it is possible that there are a few others elsewhere that I am not aware of. True enough, there are the science TV programmes of the UGC/EMRC and 'Turning Point' of Doordarshan, but these suffer for want of sponsors; with the introduction of cable TV we can watch the infrequent science show from BBC TV (e.g. 'The Mavericks'), but here too, an occasional jarring note is struck by giving equal time to Rupert Sheldrake (who says we all live in a morphogenetic field), and Benveniste (who reported that homeopathy operates through molecular imprinting in water) as to Linus Pauling.

What we need is proper, regular, frequent, informed and discerning communication of science. And the need is even more acute now in the era of receding governmental investment in S&T where we need to convince private industry and corporations of the importance of investing in research and development in science and technology. It is necessary to convince people at large that long term investment in education and research is vital for material welfare and national ethos. It is important for the legislator to be able to appreciate why one needs to study, say, the mating behaviour of fish, and what its relevance is so that he does not turn into another Senator Proxmire of the derisive 'golden fleece aware' fame.

Who would do it if not us scientists and who can do it better than a practising scientist? 'Scientists are members of society, and the fruits of their work underpin and shape it. Society requires and deserves that we enter into dialogue with it; communicating our science is as important as creating it.' The above quote is from Professor Peter Day, Director, The Royal Institution, London, UK, who delivered the Ninth Blackett Memorial Lecture of the Indian National Science Academy on 10 January 1994 (see *Current Science*, 1994, **67**, 434–440). In an engaging lecture, Day traces the origin of the Royal Institution, its charter as elaborated by its founder (Count Rumford: 'diffusing the knowledge ... of ... inventions ... by lectures and experiments the applications of science to the common purposes of life'), the public lectures from the days of Humphry Davy (so popular that the street was blocked by carriages and one way traffic had to be declared, which continues to this day), his 'discovery', namely the bookbinder apprentice Michael Faraday (who became a scientist, thanks to those public lectures of Davy), Tyndall, Rayleigh, Rutherford, Bragg, Zeeman, Linus Pauling, Lord Porter and Richard Dawkins.

The role of the Royal Institution through its science communication has been unique and exemplary (one wonders what Faraday might have become, but for it). As Day concludes: '... science will not deserve to flourish unless it can succeed in explaining itself to the large group of people who have never had any professional contact with it. That is true whether one is seeking to capture the imagination of the young ... or to convince a reluctant Treasury ...'

We need to communicate science to ourselves and to our fellow citizens. The efforts of individual scientists are useful but inadequate. It should be possible for organizations to get together along with lines of COPUS (Committee on Public Understanding of Science, see Day's article) and diffuse science, its methods, its consequences and its necessity. The Current Science Association can initiate the process in Bangalore, either by itself or by getting together with the Indian Academy of Science, the Jawaharlal Nehru Centre, the National Institute for Advanced Studies, The Indian Institute of Science and the Karnataka Rajya Vigyana Parishad. Raman, who was intimately associated with some of these organizations, was known to be an avid and expert communicator of science, whose memory we perpetuate every February 28th as the National Science Day. That is as good a day as any to start this activity.

D Balasubramanian is in the Centre for Cellular & Molecular Biology, Hyderabad 500 007, India

SCIENTIFIC CORRESPONDENCE

Stereochemistry of Azadirachtins – H and I

In two earlier publications from this laboratory, the isolation[1] and determination of structure[2] of two new Azadirachtins H and I were detailed. Recently, the structure of Azadirachtin-H was determined[3] by X-ray diffraction, which confirmed the structure assigned earlier in all respects, except the stereochemistry at C-11. The structure derived by the X-ray study showed the C-11 hydrogen as β and the dihedral angle in the system H9-C9-C11-H11 was 83(5)°. We had depicted[2] in Azadirachtin-H, H-11 as a doublet (5.4, d, 4.4 Hz) coupled to H-9 as a doublet (3.1, d, 4.4 Hz) and in Azadirachtin-I, H-11 as a doublet (5.41, d, 4.4 Hz) coupled to H-9 as a doublet (3.21, d, 4 4 Hz) The NMR spectra of Azadirachtins H and I were redetermined in fresh $CDCl_3$ and the hydrogen at C-11 was seen to be a singlet in Azadirachtin-H at 5.45 ppm and the hydrogen at C-9 as a singlet at 2.61 ppm. In Azadirachtin I, H-11 was seen as a singlet at 5.35 ppm and H-9 was seen as a singlet at 2 62 ppm. Hence the H-11 hydrogens in both these compounds should be β-oriented as in Azadirachtin-B[4]. In acetone-d_6 also the hydrogens both at C-9 and C-11 were singlets.

The earlier measurements must have been vitiated by the use of poor $CDCl_3$