

## MEETING REPORT

**Perspectives and future prospects in higher mathematics\***

The workshop went off rather well: it featured a formidable assembly of Indian mathematicians, and they went about their business with great method, rigour and passion.

*M. S. Raghunathan*, TIFR, Mumbai, in his opening remarks, said that the situation is 'not very happy, but there are positives. We are not doing too badly at the peaks, but the general level has declined significantly'. He was particularly concerned about the quality of teaching and teachers: 'not enough talented people are coming in, and even the Ph D's are often of dubious ability'.

*P. Rama Rao*, Former Secretary, DST, explained how 'mathematical resources' essentially reside in academic systems. 'Funding higher mathematics would therefore involve investments in the academic edifice'; e.g. supporting academic establishments better, encouraging more national and international mathematical interactions, paying teachers more, etc. He also pointed out how investments in academic R&D are strongly correlated with per capita income. 'Currently a mere 3.5% of India's total R&D funding goes to academic R&D; it must at least be 10%'.

*C. N. R. Rao's* inaugural lecture was notable for its passion, anguish and blunt-speak, and for his penchant to utter brutal truths with such charm. Samplers: 'When it is not *higher* chemistry or *higher* physics, why should it be *higher* mathematics? That is what makes you mathematicians unpopular!' or 'DST only thinks of science once in a way'. He seemed deeply distressed at the overall decline, not just in mathematics but in all of basic sciences. 'Good undergraduate teachers are becoming extinct, Ph.D. holders now have a poorer knowledge ... we are just not working hard enough ... I fear that all our skills in science will be completely buried in five years'. He blamed the Internet for 'destroying scholarship' and said that today's scholars 'don't research; they only down-

load!'. He suggested that the way out was for India to think big: 'we must produce science for the whole world; we should become the world's best science knowledge repository'. Rao also wished that there could be an Indian Erdős who would attract the faithful like a Pied Piper, and stressed the importance of organizing science management better in India: 'China emerged as a dominant science player not because of heavy investments alone. It was the Chinese National Science Foundation that made the real difference'.

The deliberations revolved around five panels, with each panel typically having 4–6 panelists. Every panelist was requested to stick to a time limit of 15 minutes, and the big surprise was that most panelists actually finished saying their stuff in the stipulated time, and still said something that was sufficiently significant, thoughtful or provocative.

*R. Balasubramanian*, IMSc, Chennai, opening the deliberations on 'Research and Development in Pure Mathematics', struck an optimistic note: 'I have found university and college teachers to be enthusiastic and doing their best in spite of a paucity of resources', he said. He then made a series of simple, but sensible, suggestions, chiefly to empower the teacher: invite good mathematicians to university departments for 1–2 weeks to deliver well-documented lectures; pay teachers more; offer teachers a set of good books ('if the books are accessible, they or someone else will surely read them one day!') and encourage more community discussions on mathematics ('we learn best from our peers and seniors'). *S. G. Dani*, TIFR, Mumbai, said that Indian mathematics has a tremendous potential to grow, but expressed his concern that the system was not throwing up enough students of adequate quality. 'We should spread mathematics as we might spread religion', he suggested and indicated that the WWW would be the best medium to promote mathematical awareness. *G. Misra*, ISI, Bangalore, said that we need to go 'beyond mathematics' and embrace inter-disciplinary research. 'We have worked within the mathematical framework for too long; it is now time to cut across ... to interact with larger commu-

nities of engineers, physicists or biologists. He also pleaded for better administrative support and fewer bureaucratic hassles so that mathematicians can spend a larger fraction of their time usefully. *I. B. S. Passi* recommended a greater emphasis on problem solving, more fellowships for bright students, more funds for books and journals, greater focus on algebra and the energetic revival of the weekly math seminar. *V. Srinivas*, TIFR, Mumbai, expressed concern at the severe shortage of competent mathematicians 'even in elite institutions'. 'We must make research careers more attractive for mathematicians working in India, and even try to lure back NRIs', he said. His suggestions included: hold 2–3 international mathematical conferences in India every year to encourage collaborations and interpersonal interactions ('that is how the best mathematics happens ... through informal channels'); create 100 national fellowships for mathematicians; and allow professors to sponsor the participation of their students at international meetings even if they are not officially 'entitled'. Sadly, there was no government officer from the finance or accounts departments attending the meeting. I would have loved to see the look of unmitigated horror on his face after hearing his suggestion!

A large number of ideas and suggestions came up in the discussions that followed the first panel's presentation. These are summarized as quotes. 'While more international conferences in India would be useful, it would help even more if they were preceded by intense 1–2 week-long tutorials; these pre-conference tutorials are usually more useful than the big bash'. 'Create a "mathematical planetarium" of captive and high quality web content, with accompanying instructors, for the teaching and student communities'. 'Correct our intellectual conservatism; we tend to hold the "baby" even after he has completed his Ph D'. 'Mathematics has blossomed under the European Union. So can we think of an Asian Union of mathematicians?'. 'College teaching is the major bottleneck; college exams have become too easy!'. 'All too often the mathematician asks the engineer to provide him the underlying equations; this is

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