wished to make some contribution to third world science.

He returned to India in the late 90's. Although he had retired, he was full of ideas pertaining to the moduli space and its generalizations. Apart from mathematics, he was interested in Carnatic music and as I mentioned above, in modern Tamil literature as well. However, his deep interest in mathematics never waned. A few months after he had contracted the cursed disease, he wrote to me that our work had new ramifications and that they are now talking about 'Narasimhan–Ramanan branes'! He even helped a student of Oscar Garcia-Prada, our Spanish friend with some ideas, very close to his final days.

Fortunately, his stature did not go unrecognized, in India as well as internationally. He was awarded Padma Vibhushan, the Bhatnagar Prize and was a Fellow of all the three science academies of India. He was elected Fellow of the Royal Society, the Chevalier d'Ordre du merite of France, the Abdul Kalam prize and so on.

I am fortunate to have been his close friend till his very end.

S. RAMANAN

Chennai Mathematical Institute,
Chennai 603 103, India
e-mail: sramanan@cmi.ac.in

Gade Padmanabham (1964–2021)

Gade Padmanabham, Director, International Advanced Research Centre for Powder Metallurgy and Newmaterials (ARCI), Hyderabad was born on 10 August 1964. He pursued B.E. in Mechanical Engineering from Andhra University, Visakhapatnam and M.Tech. in Industrial Metallurgy at National Institute of Technology-Warangal. He worked on metal–ceramic joining and weldability of Al–Li alloys at IIT-Delhi and Technical University, Dresden, as German Academic Exchange Service-DAAD Fellow, earning Ph.D. from IIT-Delhi.

Padmanabham started his career as Deputy Manager with Bharat Dynamics Ltd, Hyderabad in 1987 and worked on indigenization of materials for strategic products. He joined Department of Science and Technology (DST) as Scientist-C in 1990 and became Scientist-G in 2006. He dealt with implementation of National Superconductivity programme, intelligent processing of materials and superconductor-based magnetic resonance imaging materials. As a Nodal Officer, he coordinated establishment of Indo-Soviet Advanced Research Centre for Powder Metallurgy. He steered international joint S&T programmes in the areas of engineering materials, electronic materials, applied mechanics, etc., with Belarus, Germany, Israel, Japan, Sweden and Switzerland for R&D, including doctoral/post-doctoral fellowships in Japan and Germany. His efforts ensured engagement of Indian scientists for working on ultra high voltage transmission electron microscopy, photon factory and super photon ring in Japan. Other such initiatives led to creation of Centre for Laser Processing of Materials with Israel and use of mega research facilities at National Laboratory for High Energy Physics, Spring-8 Accelerators and Construction of Indian beam line in Japan. He leveraged his contacts in Germany for the benefit of Indian researchers in using state-of-the-art facilities at German Electron Synchrotron, Berlin Electron Storage Ring Society, Facility for Antiproton and Ion Research, besides launching

DST-DAAD Personnel Exchange Program, DST–German Research Foundation Cooperation and DST–Max Planck partnership in niche areas, interaction of young Indian scientists with Nobel Laureates in Lindau, etc., in Germany.

Padmanabham did pioneering work on laser processing of materials, sol–gel nanocomposite coatings, carbon materials, etc. His contributions transformed the Laser Centre of ARCI as a unique facility for addressing complex problems through robotic brazing, high precision welding, micromachining and additive manufacturing for application in automotive, aerospace, nuclear, power, defense and electronics sectors. The group led by him developed transparent ceramics and also successfully transferred infra red dome technology for strategic sector. He reoriented the sol–gel nanocomposite group focusing on solar selective coatings, anti-tarnish coatings, architectural coatings and corrosion-resistant coatings. His foray into carbon materials perfected different techniques of producing carbon nanotubes, and successfully integrated with the laser group in achieving high field emission properties for strategic applications, a unique attempt proved successful at the field level. He conceptualized and implemented multi-institutional consortia projects, involving IITs, original equipment manufacturers of automotive components, Fraunhofer Institutes of Germany and private entities in developing a unique technique that combined laser welding and cold metal transfer brazing for tailor welded blanks and multi-material lightweight components. His concerted efforts resulted in development of silica-based aerogel sheets for insulation applications, sol–gel nanocomposite coatings for coloured glass, zinc sulphide infra red transparent ceramics for strategic applications and nanotitania for self-cleaning applications, with superior quality and close tolerances as compared to other processes. He and his team perfected many processes and transferred the same to a few enterprises.

After taking over as Director of ARCI in 2016, Padmanabham provided overall leadership for successful development of technologies in the fields of engineering materials and additive manufacturing and

its transfer to industry. He steered extramural and research-based consultancy projects on nanomaterials and nanocomposite coatings, engineered coatings, ceramic processing, laser-based manufacturing, automotive energy materials, solar energy materials and carbon materials through the value chain of conceptualization to commercialization. The clear focus on cutting edge technology-driven initiatives for commercialization, with simultaneous development of specialized human resources for industry, led ARCI as a premier institution winning many laurels. He ensured technology transfer and product supply activities to civilian and strategic sectors through establishing streamlined processes, appropriate costing of projects, development of intellectual property indices for scientists for engaging technology receivers, enhanced outreach through appropriate marketing strategies, etc. He, in collaboration with National Research Council of Canada, Fraunhofer Institutes of Germany, set up technology demonstration centers for extending value added services.

Padmanabham successfully implemented 30 extramural research projects and research-based consultancy projects, supported by various funding agencies and industry, at a cumulative cost of Rs 85 crore. He facilitated transfer of 18 technologies benefiting many stakeholders, thus generating revenue for ARCI. He successfully guided 8 doctoral theses and over 30 masters theses. He published 110 journal papers, presented 155 papers in conferences, contributed 8 book chapters and edited a book. He was on the Editorial Board and reviewer of 8 reputed journals. He was granted 14 patents within India, Australia, Europe and USA. For the outstanding achievements, he was bestowed many awards, the most significant being, Abdul Kalam Technology Innovation National Fellowship by INAE, Materials Research Society of India Medal, Distinguished Alumnus Award by NIT-Warangal, Lifetime Achievement Award by SAE India, SP Luthra Lecture Award by The Institution of Engineers (India) and AP Scientist Award by Govt of AP. He was elected a Fellow of National Academy of Sciences India, Indian National Academy of Engineering, AP Akademi of Sciences and Telangana Academy of Sciences. He was Chairman/Member of many scientific committees and Governing Council/Research Council of academic/R&D institutions.

Padmanabham is well remembered for integrating many Indian and overseas researchers in academia, R&D labs and industry in addressing some of the technology intensive problems across the globe. With positive and ever helping attitude, he strongly believed in widening R&D base. He delivered numerous talks at many institutions enthusing faculty for taking up research and also offered facilities in ARCI to the faculty and scholars from less endowed institutions in embarking upon R&D.

With the sad and untimely demise of Padmanabham, due to coronavirus, in a hospital in USA on 3 June 2021, scientific fraternity, in particular ARCI and DST, have lost one of the most capable materials scientists of high calibre, who represented India's emerging technological front. He left behind his mother, wife, a daughter and son-in-law and a son plus two grand children.

D. R. PRASADA RAJU[1,*]
TATA NARASINGA RAO[2]

[1]*Centre for Industrial Consultancy and Sponsored Research,*
IIT-Madras,
Chennai 600 036, India
[2]*International Advanced Research Centre for Powder Metallurgy and New Materials,*
Balapur,
Hyderabad 500 005, India
**e-mail: drpraju1955@gmail.com*