

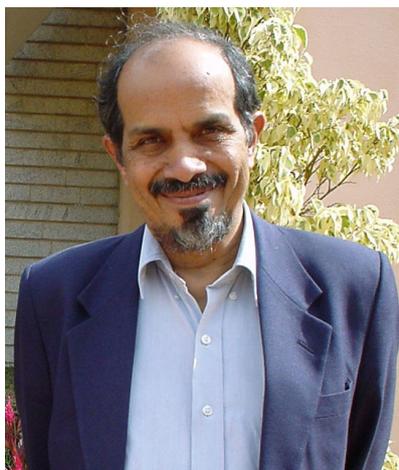
## Roddam Narasimha (1933–2020)

Professor Roddam Narsimha (RN), a doyen of Indian Science, an outstanding teacher, a world-class researcher, a dynamic leader, and a builder of institutions, passed away on 14 December 2020. He was 87 and is survived by wife, Neelima Narasimha, and daughter, Maithreyi Narasimha.

RN's life was simplicity itself. He was born on the south side of Bangalore and moved to the north side, where he lived a quiet family life until the last. Except for four or so years at Caltech as a Ph.D. student, excluding some visits abroad of varying durations, he spent all his professional and personal life in Bangalore – first at the Indian Institute of Science (IISc), then at the National Aerospace Laboratories (NAL), the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) and the National Institute of Advanced Studies (NIAS), often in more than one of them at the same time. This prosaic description belies the important role he played in the country and abroad as a first-rate academician and a scientific leader, and the uniform admiration he enjoyed from all those who knew him. Even the leadership positions that he held during his long and distinguished career, and the institutions he built and the important science policy decisions he influenced, do not adequately explain why he is so highly regarded. Not even the acclaimed quality of his science, which began with a single-author paper at age 24 and had not ended when he breathed his last, explains it. How to summarize the life of this extraordinary man in 1000 or so words? We will not pretend to do justice to that tall order here, but will be content mainly to provide quick reflections, more to serve as a notice of his passing away, with only a modest commentary on the qualities that made him special.

RN studied Mechanical Engineering at the University College of Engineering (now UVCE), Aeronautical Engineering at IISc and obtained Ph.D. at Caltech. After his Caltech sojourn, he joined IISc, in 1962, as Assistant Professor of Aeronautical Engineering and never relinquished his connections with IISc. His success there became legendary. Much of the research in those days concerned shock structure and the Boltzmann equation, turbulent bursting, wave structure

and turbulence modelling, reverse transition or relaminarization (where a turbulent flow goes back to an orderly laminar state), flow control, supersonic flows and drag reduction. An ingenious example of how the boundary layer theory could be applied outside of fluid mechanics is his work on the vibration of elastic strings: the partial differential equation (PDE) that RN derived is named after him, the only PDE to be named after an Indian. In



these early years, RN was deeply influenced by his two mentors, Satish Dhawan (IISc and the Indian Space Research Organisation) and Hans Liepmann (Caltech); the former provided great inspiration not only for doing research but also in thinking about problems that had particular relevance to India, whereas the latter influenced him in looking at new problems – both in terms of interesting science in itself and as a source of applications demanding new outlook.

RN's involvement in the aeronautical programmes in the country became deeper in 1970s and he was closely associated with aerospace development at both technical and policy-making levels. This interest eventually led to his appointment as the Director of NAL (1984–1993). His tenure there saw several new initiatives, including the lead role in the development of Light Combat Aircraft (LCA), parallel computing, civilian aircraft and numerical modelling of the monsoons. His focus was on developing advanced technologies and building products.

We need not belabor the importance to India of monsoons and related weather

phenomena, and the inadequacy in this respect of what was being done in the country in the 1970s. Around that time, RN helped nucleate an interdisciplinary group interested in the monsoons. This effort soon led to the formation of the Centre for Atmospheric (and now also Oceanic) Sciences in 1982, with RN as its Convener. Since convective clouds are central to monsoons, novel laboratory simulation of cloud dynamical conditions was attempted along with simple to complex models of the Indian monsoon. He advanced the Direct Numerical Simulations of clouds to understand the mechanisms of entrainment, and felt that the bulk parametrizations used in numerical models in the 1980s were unsuitable for Indian monsoons. He conceived the Monsoon Trough Boundary Layer Experiment (MONTBLEX) carried out in the Indo-Gangetic Plains in the year 1990, to measure the atmospheric boundary layer properties and derive land-atmosphere flux relations relevant to monsoon. The data analysis led to new formulation for surface heat flux at low winds. The monsoon prediction needed special attention, and RN strongly advocated the formation of the Ministry of Earth Sciences and guided its approval by the Indian Government. Improvements that have been made in India in the past decade on the forecasting of short-term weather and cyclones are visible outcomes of this initiative. RN conceptualized the Indo-French atmospheric research satellite Megha-Tropiques launched in 2011 to observe tropical clouds.

RN was the President of the Indian Academy of Sciences during 1992–1994. During that time, he started the journal, *Resonance*, published by the Academy to popularize science among the young. Another Academy journal, *Sadhana*, is also his creation. He was instrumental in conceiving the 'Asian Congress of Fluid Mechanics', which has now emerged as a prestigious international conference in Asia.

A few years after his retirement from NAL, RN was called upon to direct NIAS as its second Director (1997–2004). It was here that he honed his interests in history of science and philosophy. One of the lesser known activities of RN during his NIAS period is his Indo-US dialogues on India's nuclear

policy. As a member of the Scientific Advisory Council to former Prime Ministers Rajiv Gandhi and Manmohan Singh, he was instrumental in establishing a major parallel computing initiative in the country. He served a critical role as the longest-serving Member of the Space Commission.

Some of RN's Indian distinctions include the Bhatnagar Award, the Gujar Mal Modi Award, the Ramanujan Award, the Aryabhata Award, the Padma Vibhushan, the National Science Chair, and many others. He was a Fellow of all the Academies in India, and Honorary Fellow of the Indian Institute of Science. His external recognitions included elections to the US National Academy of Sciences and of Engineering, the Royal Society of London, the American Academy of Arts and Science, and The World Academy of Sciences (TWAS). Among the visiting positions he held are the Clark B. Millikan Professor and Sherman Fairchild Distinguished Scholar, both at Caltech, and the Jawaharlal Nehru Professor of Engineering at Cambridge University in England. For a fuller list of his accomplishments and honours, please visit the website: <http://www.jncasr.ac.in/roddam/>

RN was a highly cultured scholar and combined the best from the West and the East. He attempted a balance between 'building' and 'doing' and brought to bear his unique perspective on every

problem he touched. His awareness of the complexity of the country only enhanced his keen love for it. He firmly believed that Academies should not merely recommend action to the government, but also constructively do things themselves. Deeply immersed in acquiring and creating knowledge, he enjoyed the bliss of pursuing research with meticulous attention to detail, and could masterfully communicate that enjoyment to inspire young minds. Rather than follow fashionable research trends, he taught his students to work on questions that excited them and pursue them in depth, emphasizing quality over quantity. He was progressive in his thinking on social issues and seemed free of prejudices connected with region, religion, gender and age.

The many honours and recognitions that came RN's way made no difference to his personal qualities that endeared him to so many in the first place: easy accessibility to all – despite disparities of their stations in life (whether a novice student, a distinguished colleague, or a high-level official); his unswerving commitment to completing responsibilities once accepted; the dignity with which he interacted with people of all walks of life; abiding interest in intellectual pursuits and love for truth, scientific tenor and erudition; unprejudiced and disciplined advice that he provided when it was sought; clarity of thought in spoken and

written words; the personal example he naturally and effortlessly set, the genuineness of curiosity he displayed, and the inspiration he provided to a number of younger colleagues. He mentored generations of students and supported their scientific activities long after they established their independent careers. He was generous with his time and gently encouraged others in their pursuits.

These qualities made him an extraordinary human being, winning a place in the hearts of many friends all over the world. All his former students and colleagues, and many others who came in contact with him, miss him and perceive the void that his demise has created; they will remember him and his legacy for a long time.

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## Hema Ramachandran (1962–2020)

Professor Hema Ramachandran – Hema to all who knew her, passed away during the early hours of 24 November 2020, after a long illness. The light and matter physics (LAMP) group of the Raman Research Institute (RRI) lost a fine scientist and one of its founding members.

After a Master's degree in physics from IIT Bombay, Hema joined the training school of the Bhabha Atomic Research Centre (BARC), Mumbai. She then worked in high pressure physics and uncovered a novel phenomenon, viz. a material becoming amorphous when subjected to pressure. Her contributions and promise were recognized by an INSA Young Scientist Award. Hema moved to Bangalore after marriage and was posted

at the BARC's seismological station at Gauribidanur. This meant taking up a new area of science.



RRI had a close linkage with the BARC seismology group, which had provided support for a radio telescope

facility at Gauribidanur. Hema used an office on the RRI campus when needed. In 1995, she was offered a faculty position by the then director, Prof. N. Kumar, who was keen to start activity in the emerging area of light matter interactions. Hema took up the challenge of entering yet another field. In this venture, she had strong support from R. Srinivasan, an outstanding and versatile physicist, just retired from the Inter University Centre in Indore, and Kumar himself. Looking back it now seems that she had found her true calling.

One of us (A.N.) had just finished a theoretical Ph.D. thesis at RRI and recalls the experience of working hands-on, doing experiments with Hema who