Late Professor V. Radhakrishnan

In his guest editorial, Arunan[1] has pondered upon the criterion that was used by the selection committee of Raman Research Institute (RRI), (the Raman Trust) for appointing V. Radhakrishnan, son of C. V. Raman, as the Director of the Institute in 1971.

Let me at the outset comment that during 1950s and 1960s, radio astronomers from many countries had made truly outstanding discoveries that revolutionized our understanding of the Universe, such as the discoveries of radio galaxies and quasars, HI from our Galaxy, Microwave Background Radiation that is a consequence of the Big Bang origin of the Universe, Pulsating radio sources (Pulsars) associated with the highly magnetized neutron stars, etc. In 1971, the selection committee of the Raman Trust would have been aware of the important contributions made by Radhakrishnan during 1960s to the rapidly evolving field of radio astronomy that I describe next. The Trust may have also considered that the TIFR had constructed a very large 530 m × 30 m size radio telescope at Ootacamund in South India that had become operational in early 1970, and that RRI scientists could also exploit it for research in the field of radio astronomy.

After his B Sc from the University of Mysore in 1950, Radhakrishnan joined the Chalmers Institute of Technology in 1955 and later the well-known radio astronomy group at Caltech, USA, in 1957. Using the Owens Valley interferometer consisting of two 90-ft parabolic dishes operating at 960 MHz, Radhakrishnan published several important papers during 1959–64 measuring the distributions of polarization in radio galaxies. Another important contribution was his measurement of the polarization of radio waves from the Van Allen-like belts surrounding Jupiter, published in *Physical Review Letters*. Subsequently, he joined the Radio Physics Division of CSIRO, Australia, in 1965 and stayed there till 1971. Using the 64 m Parkes Radio Telescope, Radhakrishnan and his colleagues made a survey of the absorption and emission of 21-cm line emission by the neutral hydrogen towards a large number of galactic and extragalactic radio sources, providing valuable information about the interstellar medium. His pioneering observations made during 1969s, that brought him further international recognition, were three papers (two in *Nature* and one in *ApJ Lett.*) that determined for the first time the rotational model and polarization structure of pulsars, that are associated with the highly magnetized neutron stars. The *ApJ Lett.* has 557 citations as of now. The total number of citations for 32 papers published by Radhakrishnan during 1960–1971 is 1290 (NASA-Astrophys Data System).

Arunan noted that ‘to his credit Radhakrishnan has served RRI well during his tenure’. He has also mentioned that Radhakrishnan had built flying machines and boats. I may comment that I wish I had such hobbies! I would also like to note that due to his numerous important scientific contributions, Radhakrishnan was elected as a Fellow of the prestigious National Academy of Sciences in USA in 1996, an honour shared by only about 2000 persons in the world.

1. Arunan, E., *Curr. Sci.*, 2018, **114**(7), 1385–1386.

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Eighteen National Institutes of Technology in the top 100 NIRF engineering ranking

The National Institutional Ranking Framework (NIRF), launched in 2015 by the Ministry of Human Resource Development (MHRD), Government of India, ranks higher educational institutions (HEIs) in the country using India-specific parameters. The ranking for 2018 was announced recently and considers five broad parameters: teaching, learning and resources (30%); research and professional practices (30%); graduation outcomes (20%); outreach and inclusivity (10%), and perception (10%).

In NIRF 2018, 906 institutions participated in the rankings for engineering and NIRF assigned scores to the top 100. Predictably, 8 out of the top 10 positions went to the Indian Institutes of Technology. Out of the next tier of institutes of national importance in the country, namely the National Institutes of Technology (NITs), 18 appeared in the top 100.

In a recent exercise, Prathap[1] identified 20 leading HEIs on their perceived potential to join the ranks of the best universities in the world using a matrix totalization procedure[2] with data from NIRF 2017. As we now have the bibliometric and econometric data for the 18 NITs in NIRF 2018, we repeat this exercise to see how the NITs can be ranked for excellence in a socio-economic and research excellence perspective alone. Using the methodology outlined earlier[1,2], we examine if the research performance of the 18 NITs as well as their earnings related to innovation activities (sponsored research and consultancy) are commensurate with the inputs (faculty and total expenditure) deployed by the institutions. A simple output–input ratio becomes a measure of how the totalized input is productively (or efficiently) translated to output[1,2].

From NIRF data the two key inputs taken cognizance of are the total number of regular faculty, F, and the total expenditure, S, for three years (2014–17). The key outputs are the total earnings, E, for three years (2014–17), and the total bibliometric output, X, measured in units of exergy[3]. Both inputs and outputs are in incommensurable units. Here, we