Indian Institutes of Science Education and Research (IISERs), from where Ananth is now appealing again for a new initiative involving the research institutes of India. Teaching undergraduate students in our national research institutions is not an easy undertaking, even though it may be for a small intake of 30 students in a year. Further, as suggested by Ananth[1], it has to include teaching of humanities and ancillary courses as well. The character of our national research institutes would necessarily have to change for a good cause.

Some of our large universities and degree-awarding institutions do have an excellent track record for doing research. However, in majority of our university system of education, the undergraduate colleges are isolated from the research atmosphere of our university campuses. As mentioned earlier, undergraduate students do get registered under large universities, but do not get the benefit of seeing the research being done by the university professors or even get to listen to the lectures given by some of these outstanding researchers in our university system. Our undergraduate students do not get to see their role-model research scientists at work. How can they be motivated for taking up a scientific research career, when they do not see researchers at work around them? They do not get the opportunities of walking into any of the research laboratories of their senior research professors to get the flavour of research.

Over the years, the Indian universities and colleges must enrich the research culture in their locations and this will take a long time, but in the meantime, the national research institutions must selectively open their doors to the undergraduate science students as suggested by Ananth.

1. Ananth, S., *Curr. Sci.*, 2014, **106**(7), 913.

P. J. LAVAKARE

19, Khagol Society,
38/1, Panchavati, Pashan Road,
Pune 411 008, India
e-mail: lavakare@vsnl.com

Shanti Swarup Bhatnagar Prize: an inspiration for international recognitions

The Shanti Swarup Bhatnagar Prize for Science and Technology, popularly known as Bhatnagar Award, was instituted in 1957 with the objective to recognize conspicuously important and outstanding contribution to human knowledge and progress – fundamental and applied – through work done primarily in India during the five years preceding the year of the Prize in seven disciplines, viz. (i) Biological Sciences, (ii) Chemical Sciences, (iii) Earth, Atmosphere, Ocean and Planetary Sciences, (iv) Engineering Sciences, (v) Mathematical Sciences, (vi) Medical Sciences and (vii) Physical Sciences. A person has to be less than 45 years of age to be nominated for the Bhatnagar Award. From 2010, Persons of Indian Origin (PIO) and Overseas Citizens of India (OCI) are also eligible to be nominated for the award[1]. Over the years, the Bhatnagar Awardees have acquired a unique status among the scientific community and serve as role models for younger scientists to emulate. It is, therefore, a great responsibility on the part of Bhatnagar Awardees to live up to the standards of the Award and bring glory to India through International recognition.

The Royal Society of London, established in 1660, is one of the oldest scientific societies in the world. It has around 1450 Fellows and Foreign Members drawn from all areas of science, engineering and medicine, including more than 80 Nobel laureates[2]. Data indicate that 39 scientists of Indian origin, who obtained their tertiary-level education from India, have been elected as Fellows of the Royal Society (FRS), London since the inception of the Bhatnagar Award, and out of these 23 are Bhatnagar Awardees (Table 1). The educational qualification of these 39 FRS indicates

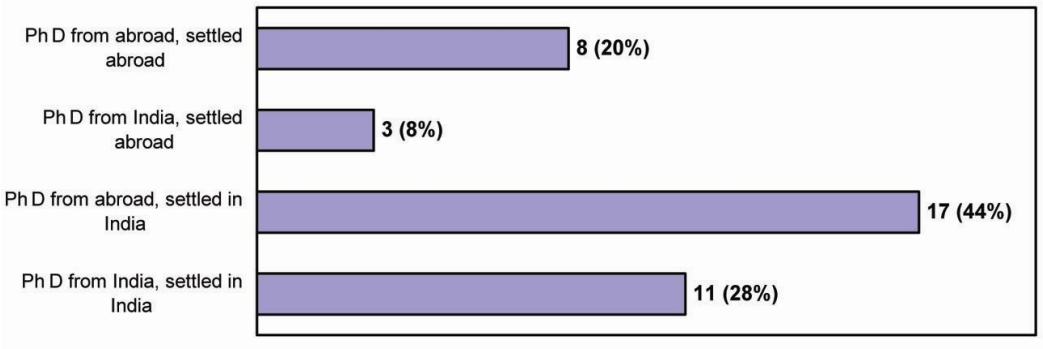

Figure 1. Educational background of Indian-origin Fellows of the Royal Society who obtained their tertiary-level education in India (1958–2014).

Table 1. Fellows of the Royal Society (FRS) who had their tertiary-level education from India since the inception of the Bhatnagar Award

Serial no.	Name (year and place of birth) Educational attainments Present place of work	Discipline	Year of Bhatnagar Award	Year of election to FRS
1	Sushantha Kumar Bhattacharyya (b: 1940, Bangladesh, then in India) B Tech – IIT Kharagpur, M Sc, Ph D – University of Birmingham, UK Professor and Chairman, WMG University of Warwick, UK	Engineering	–	2014
2	Krishnaswamy VijayRaghavan (b: 1954, Tamil Nadu) B Tech, M Tech – IIT Kanpur, Ph D – TIFR Mumbai Secretary, Department of Biotechnology (DBT), New Delhi, India	Genetics	1998	2012
3	Girish Saran Agarwal (b: 1946, Uttar Pradesh) B Sc – Gorakhpur University, M Sc – BHU Varanasi, Ph D – University of Rochester, USA Noble Foundation Chair & Regents Professor, Oklahoma State University, USA	Physics	1982	2008
4	Ramesh Narayan (b: 1959, Tamil Nadu) B Sc – Madras University, M Sc, Ph D – Bangalore University Thomas Dudley Cabot Professor, Harvard University, USA	Astrophysics	–	2006
5	Mriganka Sur (b: 1953, Uttar Pradesh) B Tech – IIT Kanpur, Ph D – Vanderbilt University, Nashville, USA Paul E and Lilah Newton Professor and Director, Simons Center, MIT, USA	Neuroscience	–	2006
6	Goverdhan Mehta (b: 1943, Rajasthan) B Sc, M Sc – University of Rajasthan, Ph D – University of Poona National Research Professor and Lilly-Jubilant Chair Professor University of Hyderabad, Hyderabad	Chemistry	1978	2005
7	Venkatraman Ramakrishnan (b: 1952, Tamil Nadu) B Sc – Baroda Uiversity, Ph D – Ohio University, USA MRC Laboratory of Molecular Biology, Cambridge, UK	Structural biology	–	2003
8	Shrinivas Kulkarni (b: 1956, Maharashtra) M S – IIT New Delhi, Ph D – University of California, Berkeley, USA Director, Caltech Optical Observatories, USA	Astronomy	–	2001
9	Mandyam Veerambudi Srinivasan (b: 1948, Maharashtra) M Sc – IISc Bangalore, Ph D – Yale University, USA Professor of Visual Neuroscience, Queensland Brain Institute, Australia	Neuroscience	–	2001
10	Madabusi Santanam Raghunathan (b: 1941, Andhra Pradesh) B A (Hons) – University of Madras, Ph D – University of Bombay DAE Homi Bhabha Professor, TIFR, Mumbai, India	Mathematics	1977	2000
11	Tiruppattur Venkatachalamurti Ramakrishnan (b: 1941, Tamil Nadu) B Sc, M Sc – BHU Varanasi, Ph D – Columbia University, USA DAE Homi Bhabha Chair, BHU, Varanasi, India	Physics	1982	2000
12	Raghunath Anant Mashelkar (b: 1943, Goa) B E, Ph D – University of Bombay National Research Professor and President, Global Research Alliance, Pune, India	Polymer engineering	1982	1998
13	Ashoke Sen (b: 1956, West Bengal) B Sc – Presidency College, Calcutta, Ph D – Stony Brook University, USA Harish-Chandra Research Institute, Allahabad, India	Physics	1994	1998
14	Sathamangalam Ranga Iyengar Srinivasa Varadhan (b: 1940, Tamil Nadu) B Sc – University of Madras, Ph D – Indian Statistical Institute, Kolkata Courant Institute of Mathematical Sciences, New York University, USA	Mathematics	–	1998
15	Mudumbai Seshachalu Narasimhan (b: 1932, Tamil Nadu) B A (Hons) – University of Madras, Ph D – University of Bombay Indian Institute of Science, Bangalore, India	Mathematics	1975	1996
16	Gurdev Singh Khush (b: 1935, Punjab) B Sc – PAU Ludhiana, Ph D – University of California, USA Adjunct Professor – University of California, USA	Plant breeding and genetics	–	1995
17	Roddam Narasimha (b: 1933, Karnataka) B E – University of Mysore, Ph D – California Institute of Technology, USA Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India	Aerospace	1974	1992
18	Govind Swarup (b: 1929, Uttar Pradesh) B Sc, M Sc – Allahabad University, Ph D – Stanford University, USA Settled in Pune, India	Radio astronomy	1972	1991
19	Man Mohan Sharma (b: 1937, Rajasthan) B E, M Sc (Tech) – University of Bombay, Ph D – University of Cambridge, UK Settled in Mumbai, India	Chemical engineering	1973	1990

(*Contd*)

Table 1. (*Contd*)

Serial no.	Name (year and place of birth) Educational attainments Present place of work	Discipline	Year of Bhatnagar Award	Year of election to FRS
20	Conjeevaram Srirangachari Seshadri (b: 1932, Tamil Nadu) B A (Hons) – University of Madras, Ph D – University of Bombay Director – Emeritus, Chennai Mathematical Institute, India	Mathematics	1972	1988
21*	Ashesh Prosad Mitra (1927–2007, b: West Bengal) B Sc, M Sc, Ph D – Calcutta University	Physics	1968	1988
22	Coluthur Gopalan (b: 1918, Tamil Nadu) M D – University of Madras, Ph D – University of London, UK Settled in Chennai, India	Medical	–	1987
23*	Vulimiri Ramalingaswami (1921–2001, b: Andhra Pradesh) M D – Andhra Medical College, D Sc – Oxford University, UK	Medical	1965	1986
24*	Obaid Siddiqi (1932–2013,b: Uttar Pradesh) B Sc, M Sc – Aligarh Muslim University, Ph D – Glasgow University, UK	Biology	1975	1984
25*	Sivaramakrishna Chandrasekhar (1930–2004, b: West Bengal) B Sc (Hons), M Sc – Nagpur University, Ph D – Cambridge University, UK	Physics	1972	1983
26	Chintamani Nagesa Ramachandra Rao (b: 1934, Karnataka) M Sc – BHU Varanasi, Ph D – Purdue University, USA National Research Professor and Linus Pauling Research Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India	Chemistry	1968	1982
27*	Autar Singh Paintal (1925–2004, b: Burma) MBBS, MD – KGMC Lucknow, Ph D – University of Edinburgh, UK	Medical	–	1981
28*	Devendra Lal (1929–2012, b: Uttar Pradesh) B Sc, M Sc – BHU Varanasi, Ph D – University of Bombay	Physics	1967	1979
29*	Gopalasamudram Narayana Ramachandran (1922–2001, b: Kerala) B Sc – St Joseph's College, Tiruchi, M Sc – University of Madras, Ph D – University of Cambridge, UK	Physics	1961	1977
30	Monkombu Sambasivan Swaminathan (b: 1925, Tamil Nadu) B Sc – University of Travancore, B Sc (Agriculture) – University of Madras, Ph D – University of Cambridge, UK Settled in Chennai, India	Agriculture	1961	1973
31*	Harish Chandra (1923–1983, b: Uttar Pradesh) B Sc, M Sc – University of Allahabad, Ph D – University of Cambridge, UK	Mathematics	–	1973
32*	Benjamin Peary Pal (1906–1989, b: Punjab) B Sc, M Sc – University of Rangoon, Burma, Ph D – University of Cambridge, UK	Agriculture	–	1972
33	Mambillikalathil Govind Kumar Menon (b: 1928, Karnataka) B Sc – Jodhpur, M Sc – Royal Institute of Science, Bombay, Ph D – University of Bristol, UK Settled in New Delhi, India	Physics	1960	1970
34	Calyampudi Radhakrishna Rao (b: 1920, Karnataka) M A (Mathematics) – University of Andhra, M A (Statistics) – University of Calcutta, Ph D – University of Cambridge, UK Distinguished Professor Emeritus, University of Hyderabad, Hyderabad, India	Statistics	1959	1967
35*	Panchanan Maheshwari (1904–1966, b: Rajasthan) B Sc, M Sc, D Sc – University of Allahabad	Botany	–	1965
36*	Thiruvenkata Rajendra Seshadri (1900–1975, b: Tamil Nadu) B Sc, M Sc – University of Madras, Ph D – University of Manchester, UK	Chemistry	–	1960
37*	Kariamanikkam Srinivasa Krishnan (1898–1961, b: Tamil Nadu) B Sc, M Sc, D Sc – University of Madras	Physics	1958	1940
38*	Satyendra Nath Bose (1894–1974, b: West Bengal) B Sc, M Sc, Ph D – Calcutta University	Physics	–	1958
39*	Sisir Kumar Mitra (1890–1963, b: West Bengal) B Sc, M Sc, Ph D – Calcutta University	Physics	–	1958

*Deceased.

that 25 scientists amongst them obtained their Ph D from abroad and only 14 from India (Figure 1). Seventeen out of 25 FRS who obtained their Ph D abroad preferred to stay in India, whereas only 3 out of 14 FRS who obtained their Ph D from India are settled abroad. It is noteworthy to mention here that 21 out of 28 FRS settled in India are Bhatnagar Awardees.

Age profile of the Indian-origin FRS, who had their tertiary-level education from India, varied between 42 and 73 years at the time of their election to FRS. Kariamanikkam Srinivasa Krishnan,

Table 2. Age of Indian-origin FRS at the time of their election

Age (years)	Number of Indian-origin FRS	Relative percentage
41–45	4	10.26
46–50	6	15.38
51–55	8	20.51
56–60	9	23.08
61–65	8	20.51
66–70	3	7.69
71–75	1	2.57
Total	39	

Table 3. Time taken from the receipt of Bhatnagar Award to election to FRS

Time taken from the receipt of Bhatnagar Award (years)	Number of Bhatnagar Awardees elected as FRS	Relative percentage
0–5	1	5
6–10	3	14
11–15	5	23
16–20	8	35
21–25	3	14
26–30	2	9
Total	22 + 1*	

*Kariamanikkam Srinivasa Krishnan, the first recipient of the Shanti Swarup Bhatnagar Prize, is the only scientist who has got the FRS 18 years prior to the Bhatnagar award, as to begin with there was no age limit for nomination to the Bhatnagar Award.

Mambillikalathil Govind Kumar Menon and Ashoke Sen are the youngest amongst 39 FRS, elected at the age of 42 years, while majority (64.10%) of FRS of Indian origin have been elected at the age between 51 and 65 years (Table 2). Data indicate that Bhatnagar Awardees have been elected to FRS after 4–27 years of getting the Bhatnagar Award (Table 3). Ashoke Sen, a recipient of the Fundamental Physics Prize for the year 2012 (ref. 3), is the youngest among scientists of Indian origin elected as FRS, 4 years after receiving the Bhatnagar Award.

Thus the recognition of excellence through Bhatnagar Award, India's most coveted prize in science and technology, acts as a catalyst in motivating the scientists to pursue world-class research, which may lead to other national and international recognitions.

1. www.csirhrdg.res.in
2. www.royalsociety.org
3. www.fundamentalphysicsprize.org

INDERPAL SINGH
RAJESH LUTHRA*

CSIR Human Resource Development Group,
CSIR Complex,
New Delhi 110 012, India
**e-mail: luthra57@rediffmail.com*