The 22 youngest Bhatnagar laureates

The Shanti Swarup Bhatnagar (SSB) Prize for Science and Technology was instituted by Council of Scientific and Industrial Research, Government of India in 1957 with the objective to recognize important and outstanding research contributions across seven disciplines: biological, chemical, earth–atmosphere–ocean–planetary, engineering, mathematical, medicine and physical sciences. Awarded annually, the SSB Prize is India's highest honour for scientific accomplishments bestowed by the Prime Minister to leading scientists less than 45 years of age. Since the inception of Prize, there have been 574 Bhatnagar laureates; among these 102 are in physical sciences, 101 in biological sciences, 98 in chemical sciences, 82 in engineering, 73 in mathematics, 66 in medical sciences and 52 in earth, atmosphere, ocean and planetary sciences. Twenty one of the awardees are women[1].

Table 1 shows the list of 22 youngest Bhatnagar laureates.

It is worth mentioning that among the 14 Bhatnagar awardees elected as Foreign Associates of the National Academy of Sciences (NAS), USA and 26 awardees elected as Fellows of the Royal Society (FRS), London till date[2], three and seven respectively, happen to be among the 22 youngest Bhatnagar laureates.

Table 1. The 22 youngest Bhatnagar laureates (1958–2020)

Name	Age (yrs) at the time of the SSB Prize	Discipline
M. G. K. Menon, FRS	31	Physical Science
M. M. Suri	33	Engineering Science
C. N. R. Rao, FRS, Foreign Assoc, US NAS	33	Chemical Science
V. Kumaran	33	Engineering Science
S. Kalyanaraman	34	Medical Science
Virendra Singh	34	Physical Science
Goverdhan Mehta, FRS	34	Chemical Science
Neena Gupta	34	Mathematical Science
M. S. Swaminathan, FRS, Foreign Assoc, US NAS	35	Biological Science
D. S. Athwal	35	Biological Science
H. K. Jain	35	Biological Science
M. M. Sharma, FRS	35	Engineering Science
M. S. Raghunathan, FRS	35	Mathematical Science
Asis Datta	35	Biological Science
H. N. Sethna	36	Engineering Science
B. K. Bachhawat	36	Biological Science
G. S. Agrawal, FRS	36	Physical Science
S. K. Joshi	36	Physical Science
P. Balaram	36	Chemical Science
Biman Bagchi	36	Chemical Science
Manindra Agrawal, Foreign Assoc, US NAS	36	Mathematical Science
Nitin Saxena	36	Mathematical Science

1. http://www.ssbprize.gov.in
2. Singh, I. and Bhardwaj, M., Bhatnagar laureates 1958–2018, CSIR, New Delhi.

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Natural resource sustainability

This is with regard to the 'Opinion' by Pujari *et al.*[1].

It is intellectually exciting and materially comprehensive from natural resource sustainability viewpoint. But for a person with a background of natural resource characterization and assessment and of application of the resultant information to resource regeneration, the topic of research and its ultimate objective provoke several irritating observations. Historically, India was a pioneer amongst the newly independent countries to have considered science and technology (S&T) as the approach for economic and industrial growth, including improved management of natural resources. Hence, the first five-year plan in 1952 had made soil and water conservation research and application as a plank for the much needed rural development. Realizing that spatial information on soil characteristics and land-use was a prerequisite to such an activity, a nationwide set-up was also established for the purpose. The resultant information was interpreted in the form of land-use capability classes that were based on soil characteristics, physiography, slope and climate. For more challenging environments, such as the desertic and hilly tracts, there existed an even more holistic approach. However, application of this or the earlier land-use capability-based suggested land use, and soil and water conservation treatments such as strip cropping, contour cultivation and bunding, or excluding the more vulnerable lands from cultivation and putting them under permanent vegetation cover, though technologically sound, did not find acceptance with the actual users of land. The poor-capability lands mostly belonged to resource-poor, small and marginal farmers, who could ill-afford costly land treatments or taking the land out of cultivation. Worst cases for implementation of conservation programmes were the community grazing lands, forests and common water conservation structures. Only a limited set of treatments, namely field bunding, check dams and some vegetative measures found favour with the farmers. This situation has not changed much during the subsequent eras of control of desertification or protection of biodiversity resulting from exploitative use or global warming.

The green revolution technology, which enabled us to come out of the era of chronic food shortage is based on positive interaction of a responsive crop variety, use of fertilizers and assured water supply, largely based on irrigation from groundwater. As a result of this intensive management, the soils are showing fatigue but worst has been the deterioration of groundwater resources, partly in the form of water quality but excruciatingly so in the depletion of aquifers. Seeing this trend, the country established a rather dense monitoring network, which probably is one of the finest in the world. But despite all its findings of a huge depletion, which at places in Gujarat and Rajasthan show fall in groundwater table of 500–1000 m and an overexploitation by 40–80% above the mean annual recharge and several programmes to recharge aquifers, it has not been possible to halt the trend nevertheless reverse it. Problem of sea-water incursion in coastal areas resulting from overexploitation of shallow aquifers remains unresolved.

The purpose of this response is not to deter from studies aimed at establishing interactions between biotic and abiotic factors, or of establishing spatio-temporal variations of attributes related to water, sediment or earth elements at various spatial scales, or of likely stresses emanating for climate change scenarios, but to warn of the unrealistic nature of cherished application of this hard-earned knowledge to better prepare the country to a challenging future. We have an extremely high density of human population and over 60% of it is greatly dependent upon land and its primary productivity as a means of livelihood. As a result, even marginal lands are being put to use and this pressure, as also of livestock, is growing. In addition, there is an ever-increasing demand of land and water for urban, industrial and eco-service needs. Though gifted with a monsoonal rainfall regime, which sets in within a well-defined framework of time, there is a large variability in the amount and distribution of rainfall, particularly in the large, drier parts of the country. It is not uncommon to see that a large part of our peninsular region suffers from drought in one year and floods in another.

One wishes the earth observatory programme a good success, but it will hugely add to its basic and pragmatic value if by making use of the already available voluminous, multi-disciplinary data, it can demonstrate the possible solutions to our obvious natural resource issues.

1. Pujari, P. R. *et al.*, *Curr. Sci.*, 2020, **118**(10), 1487–1488.

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