

Analysis of age distribution of Bhatnagar prize winners

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Analysis of the age distribution of Bhatnagar prize winners during the last four decades, points to a gradual shift to the 'boundary condition', as years went by. It may perhaps be necessary to consider now raising the upper age limit of aspirants.

THE names of year 2000 Bhatnagar Prize winners were announced on 26 September 2000 by the Director General, Council of Scientific and Industrial Research (CSIR), New Delhi. Of the ten recipients three are aged 45 years and one is aged 34 years.

The Shanti Swarup Bhatnagar (SSB) Prize for Science and Technology was instituted in 1957 in memory of the founder director and principal architect of CSIR. The Prize is now the most coveted national recognition for scientists. In the last forty-one years (1958 to 1999) a total of 343 scientists and technologists of our country have been declared the winners of the Prize. One of the important features of the Prize is that it is awarded to 'any citizen of India engaged in research in any field of science and technology up to the age of 45 years as reckoned on 31 December of the year preceding the year of the Prize'.

Objective

The objective of this study was to examine the profiles of Bhatnagar Prize winners in the seven disciplines during the last four decades and analyse their age-distribution, for the purpose of finding answers to the following two questions:

1. How many got the Prize when they attained the age of 45 years?
2. Has there been a shift in age towards the threshold, over the decades?

Data

The *Handbook of Shanti Swarup Bhatnagar Prize Winners*¹ contains data on the date of birth, specialization, address and citation of each winner (up to 1998). For the years 1999 and 2000, data were obtained from HRDG/CSIR.

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Analysis

For the purpose of this analysis, the age of an awardee was taken to be the year for which the award was given minus the year of birth of the awardee. The first award in 1958 went to the late K. S. Krishnan when he was sixty years old. Because of the exclusive nature, this award has been kept out of purview. The total number of awardees in view is 342.

Table 1 gives the age profile of all the awardees between 1958 and 1999. One in four received the Prize in his/her 45th year or later. Just over 60% got it in their 43rd, 44th, 45th or 45 + year. Approximately 24% of the scientists were aged 40, 41 or 42 years when their awards were announced. Winners of the below-40 group accounted for 16% of the total. The range of age was between 32 and 55 years (the latter due to historical reasons). The weighted average works out to be 42.45 years.

Figure 1 depicts the relationship between age and the four decades. As we move on from the first (1960–1969) to the fourth decade (1990–1999), there is a perceptible shift towards the 'border year' of 45 (from 20% in 1970–1979 to around 27% in 1990–1999).

Are there particular reasons contributing to the shift? Figure 2 *a–g* provides some clues.

In the Biological Sciences (Figure 2 *a*) 16% of the awardees were aged below 40 when they received the Prize. Nearly 26% were in the 40–42 range and just over 58% of the total in the 43–45 range. The shift towards 45 years over the decades is visible.

The picture for the Chemical Sciences (Figure 2 *b*) is similar. Awardees in the below-40 age group accounted for 13.6% of the total, those in the 43–45 age group accounted for 66% and those in the 40–42 age group accounted for 20.4% of the total.

The age distribution in the case of winners in the Earth Sciences (Figure 2 *c*) was no different. In fact the skewness to the 43–45 years range, as decades went by, was pronounced. Two-thirds of all the winners belonged to this category. Nearly 27% of the winners were in the 40–42 age group.

Around 20% of all awardees in the Engineering Sciences (Figure 2 d) were below 40 when they were declared winners. Around 33% of them were aged 40, 41 or 42 years and 48% were 43, 44 or 45 at the time of announcement of awards. There was no question of a shift here, because right through the decades, a similar distribution prevailed.

In Mathematical Sciences (Figure 2 e) surprisingly perhaps, 66% of the total number of winners belonged to the 43–45 age group. Here again, a shift was noticed.

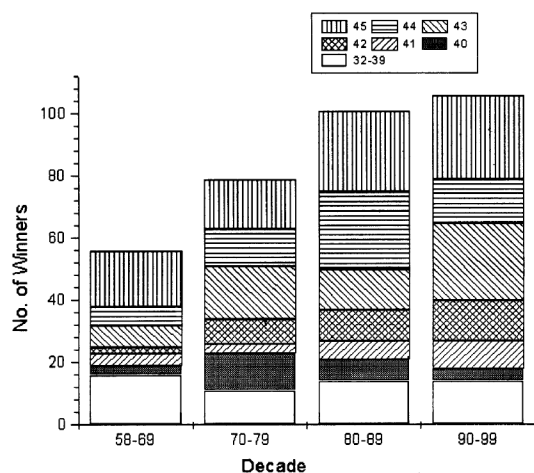


Figure 1. Relationship between age of the awardees and decade.

An interesting picture emerges in case of Medical Sciences (Figure 2 f). Nearly 83% of the total awardees were aged 43–45 years or even more (two at 55 years) when they got the Prize (due to historical reasons). Just about 10% got the Prize in their 41st or 42nd year (none at 40). It was evident that more and more scientists in the 43–45 age group received the Prize as the years rolled on.

In the Physical Sciences (Figure 2 g) nearly 24% of the awardees were below 40 years of age. The distribution of winners in the 40–45 age group was a little more even; around 30% were in the 41–42 age group, while 28% were in the 43–45 age group. The shift over the decades towards the ‘boundary layer’ was quite clear.

How many ‘pairs’ were there in different years? This was relevant because pairs of winners in their 45th year could have contributed to the ‘shift’ towards the border. According to the rules of the Prize ‘Where the recommendation for the Prize is unanimous or not less than 2/3rd of the members of the Advisory Committees have agreed to one name (or maximum two names in case they are judged to be of equivalent merit), the recommendations are submitted to CSIR’.

In other words, in the years considered, two of the best from among the eligible few were chosen. The analysis revealed that there were in all 120 ‘pairs’, i.e. 240 out of 342 scientists were declared winners in ‘pairs’. The discipline-wise distribution (Table 2) exhibited interesting features: (i) Biologists and physicists with 24 pairs each

Table 1. Age-wise distribution of Bhatnagar awardees (over four decades)

Years/decade	Age (in years)							Total
	32/35–39	40	41	42	43	44	45	
1958 and 1959	2							2
1960–1969	14	3	4	2	7	6	18	54
1970–1979	11	12	3	8	17	12	16	79
1980–1989	14	7	6	10	13	25	26	101
1990–1999	14	4	9	13	25	14	27	106
Total	55	26	22	33	62	57	87	342

Table 2. Decade-wise distribution of Prize-winning pairs

Discipline	Year/decade					Total
	1958 and 1959	1960–1969	1970–1979	1980–1989	1990–1999	
Biological Sciences	Nil	1	6	8	9	24
Chemical Sciences	Nil	1	6	5	10	22
Earth Sciences	Nil	Nil	3	4	2	9
Engineering Sciences	Nil	Nil	4	4	3	11
Mathematical Sciences	1	Nil	4	6	4	15
Medical Sciences	Nil	6	1	3	5	15
Physical Sciences	Nil	1	6	9	8	24
Total	1	9	30	39	41	120

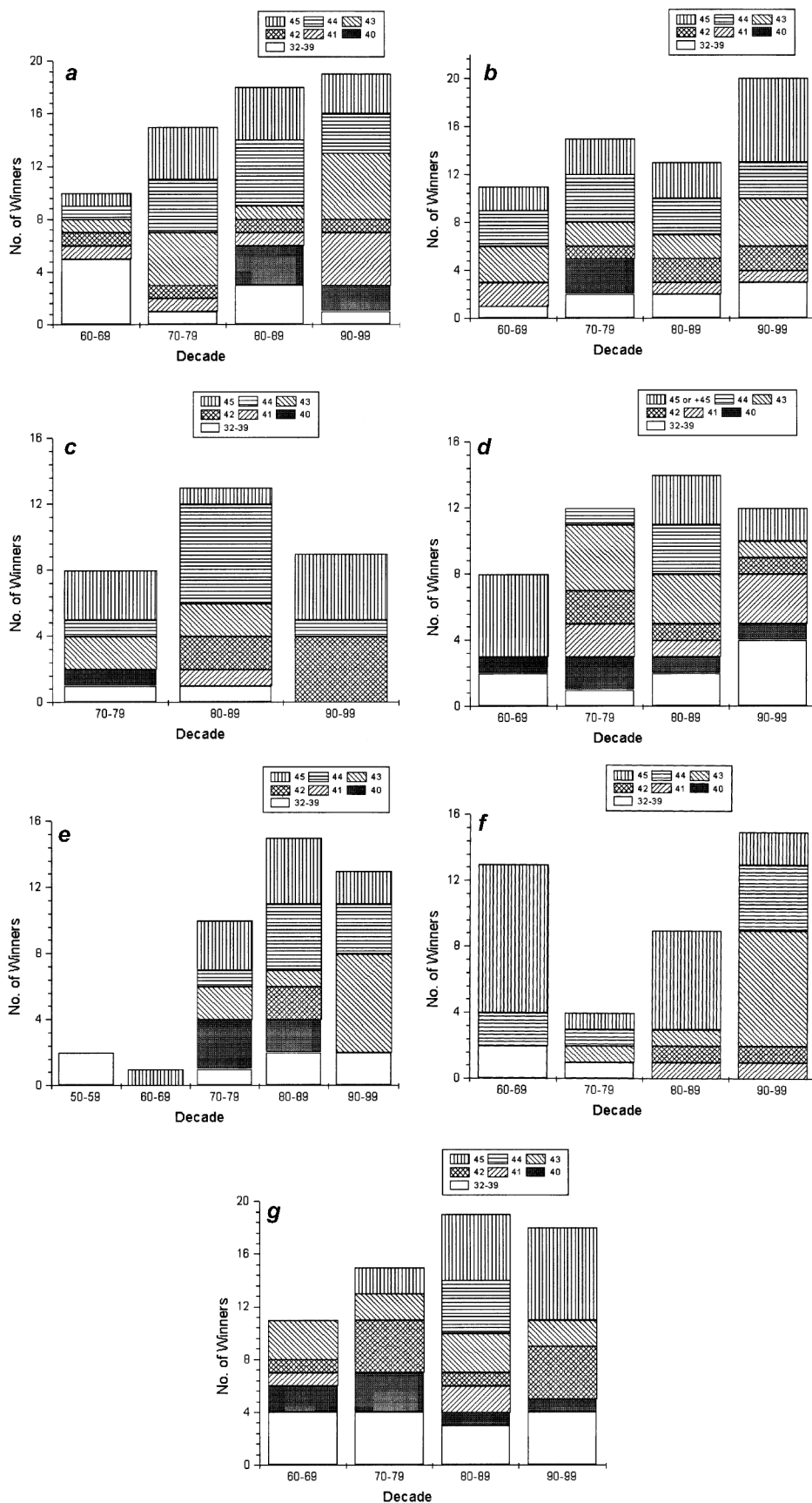


Figure 2. Relationship between age of the awardees and decade for the following disciplines: **a**, Biological Sciences; **b**, Chemical Sciences; **c**, Earth Sciences; **d**, Engineering Sciences; **e**, Mathematical Sciences; **f**, Medical Sciences; and **g**, Physical Sciences.

led the rest of the disciplines; (ii) Chemists, with 22 pairs, were just behind; (iii) Winners in Earth Sciences were in 9 pairs; (iv) Winners in Engineering Sciences had 11 pairs among them; (v) Mathematicians and Medical scientists accounted for 15 pairs each.

The selection of 'pairs' started around 1971 and, excepting for one or two years, went on uninterrupted in case of Biological, Chemical and Physical Sciences.

The 'pairs' as far as age was concerned, were randomly distributed, i.e. there were pairs of scientists separated by a few years or close to each other. There were just a dozen pairs of scientists aged 45 years each. 'Pairs', therefore, did not specifically contribute to the shift.

Discussion

That a scientist 'peaks' (or reaches a level of excellence) between the ages of 40 and 45 years is perhaps the basis of the age limit for the Prize. The majority got the award in their 43rd, 44th or 45th year. This trend may continue. Is there now a justification to consider raising the age limit of winners? In this regard, three propositions may be considered.

Proposition 1

There is no need for change in the upper age-limit. Yet, in the new millennium with the ever-increasing number of super-specialists, problems of choice may arise. However, the weighted average age of winners was close to 42 through the four decades (42.40 during 1960–1969; 42 during 1970–1979; 42.40 during 1980–1989 and 42.3 during 1990–1999).

Proposition 2

Let there be no age limit. The Advisory Committee now consists of at least six experts, including one former SSB awardee in the respective discipline and they are expected to know what is required to be done. The Committee also should appreciate the importance of recognition when it is due.

Proposition 3

Let the age limit be raised. A purely administrative reason is that the retirement age has been raised to sixty years and so a corresponding increase may not be out-of-place.

Other reasons could be: a student finishes his/her post-graduation in the 22nd year. Allowing a gap of one year, let us assume he/she gets a fellowship in the 23rd year. The Fellow is expected to register for Ph D in a year or two. By the time Ph D is awarded, his/her age may be 28 or 29. Post-doctoral work, here or abroad accounts for 2–

3 years and when the scientist is ready for a job, he/she is aged 32. It is generally known that in most of the institutions (national laboratories, university departments and other R&D institutions) there has been little induction of fresh talent. Not many can get into R&D units of the corporate sector. Even if one joins a firm, the possibility of his/her doing R&D that can win a Bhatnagar Prize is limited. With the information available, it can be inferred that hitherto there were four awardees – one in Biological and three in Chemical Sciences – from the corporate sector. This may be because opportunities of undertaking research on basic or basic-oriented applied problems, usually considered meritorious for purposes of awards, are comparatively more in government, autonomous and university laboratories.

A scientist may get a job in his/her 33rd year. Another five years may be added for him/her to stand up among peers and be counted. The time available thereafter to make a bid for the Bhatnagar Prize is 5–7 years (Note: The Prize is awarded on the basis of contributions made through work done primarily in India during the five years preceding the year of the Prize).

It may be noted that in 1962 when the Prizes were instituted in the Medical and Engineering Sciences, the age limit was placed at 55 years. The reason was traced to the decision of the CSIR Governing Body Meeting on 3 November 1962. 'It was felt that the factor of age operates differently in different disciplines, outstanding achievements coming earlier in life in certain disciplines and later in life in the case of others. In view of the possibility of delayed achievement inherent in certain disciplines, it was agreed that while normally the recipient of the awards should be below 45 years, in certain disciplines like medicine or engineering, the upper age limit may be relaxed to 55 years'. That is why during the decade 1960–1969 there were 14 awardees in these disciplines (8 of them above 50) in the 45-plus category. The age restriction of 45 years for all was imposed in 1970. This was on the basis of the recommendation of the Judging Committee. The Governing Body agreed with the Committee being 'not in favour of prescribing different age groups for basic sciences and applied sciences. Since the Prize was intended as an incentive to spur younger people, the age limit for all disciplines should be 45 years'. One argument against upward revision of age limit could be that if our sociological system (age of recruitment, etc.) does not allow the best to be recognized before they are 45 years old, then the system needs to be changed. Further the increase may probably push the winner to an older age in an analogous manner.

Conclusions

In case of Bhatnagar Prize winners, it has been noted that, in general, there was a shift over decades to recognize

them when they were near the threshold age (43–45 years). With the prevailing scenario of job opportunities it may be difficult for a scientist to stake a claim for the Prize at a relatively young age. On the other hand, there are possibilities that the scientist continues to perform even beyond 45 years. An eminent scientist avers that the Bhatnagar Award is for recognizing contributions. There may be need for an award for ‘calibre’, discovered when a scientist is quite young (between 25 and 30 years). Should one argue in favour of two awards – one for ‘promise’ and the other for ‘performance’? This assumes some relevance because at present the Prize is awarded to a scientist for his/her contributions spread over a period of five years before the actual year of the award. The recognition, as can be inferred from citations is for ‘significant contributions to . . .’ and not for a particular discovery.

The age limit of 45 years confines the consideration of the judges to contributions made by a 45-year-old proba-

ble winner when he/she was in the 40–44 year range. It is suggested that this range be extended to 42–46 years. Perhaps some force may be added to this proposition, if it is proved that a scientist beyond 45 years of age, continues to perform as per accepted norms. Information on this aspect is at present unavailable. A study, particularly related to the winners of the Prize so far, with suitable organizational support, may throw some light.

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1. Mallick Sukumar, Dewan Suguna and Dhawan, S. C., *Handbook of Shanti Swarup Bhatnagar Prize Winners*, HRDG, CSIR, New Delhi, 1999, p. 166.

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