Shanti Swarup Bhatnagar Prize: women have finally shown their might

The Shanti Swarup Bhatnagar (SSB) Prize for Science and Technology was instituted in 1957 with the objective of recognizing outstanding work in science and technology primarily carried out in India. Presently, the award carries a cash prize of rupees five lakh, a citation and a plaque. The first recipient of the prize, in 1958, was K. S. Krishnan, Director of the National Physical Laboratory (NPL), New Delhi. The first woman recipient of the award was Asima Chatterjee, Khaira Professor of Chemistry at Calcutta University who got the prize in 1961 (ref. 1). Till 2009, 454 scientists have been bestowed with the prestigious SSB Prize. The majority of these awards have gone to men and only 14 women could achieve the status of Bhatnagar Laureate till 2010 (Table 1).

The number of women scientists recommended for the coveted SSB prize has increased from one each during the decade 1961–1970 and 1971–1980 to three each during 1981–1990 and 1991–2000, and six during 2001–2010. The average age of the women recipients at the time of the award has however remained the same (43–44 years) over the decades. It is heartening to hear the announcement that in the year 2010, three of the nine scientists recommended for the SSB prize are women[2]. However, it is a long way to go before women can make up for the lost opportunities during the last five decades.

Table 1. Women recipients of Shanti Swarup Bhatnagar Prize (1958–2010)

Bhatnagar Laureate	Year of award	Discipline
Asima Chatterjee	1961	Chemical Sciences
Archana Sharma	1975	Biological Sciences
Indira Nath	1983	Medical Sciences
Raman Parimala	1987	Mathematical Sciences
Manju Ray	1989	Biological Sciences
Sudipta Sengupta	1991	Earth, Atmosphere, Ocean and Planetary Sciences
Shashi Wadhwa	1991	Medical Sciences
Vijayalakshmi Ravindranath	1996	Medical Sciences
Sujatha Ramdorai	2004	Mathematical Sciences
Rama Govindarajan	2007	Engineering Sciences
Charusita Chakravarty	2009	Chemical Sciences
Shubha Tole	2010	Biological Sciences
Sanghamitra Bandyopadhyay	2010	Engineering Sciences
Mitali Mukerji	2010	Medical Sciences

1. Kumar, S. *et al.*, *Bhatnagar Laureates, 1958–1991*, Human Resource Development Group, CSIR, New Delhi, 1992.
2. Announcement of SSB Prizes 2010, CSIR Foundation Day (26 September 2010), Celebration held at Vigyan Bhawan, New Delhi; http://csir.res.in

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Lichenometric studies and Pindari glacier retreat

Lichenometric studies in the vicinity of the Pindari Glacier have been recently reported[1].

While calculating the date of a feature/activity by lichenometry, the most essential parameters of lichen to be calculated are its growth rate and colonization delay. Colonization delay is the time taken by the lichen to grow on a surface after its exposure to the atmosphere. They are influenced by several environmental factors such as snow cover, water supply, wind, temperature, rock type, mineralogy, slope, exposure and texture of the rock face. Microclimatic and biotic factors such as, competition and nutrient supply are also of importance. Due to microclimatic variation, these parameters vary in different parts of the same area, e.g. Sanjoli and Kanlog, Shimla (Table 1)[2].

The colonization delay and growth rate of lichens, as calculated by field observations in two glaciers of the Garhwal Himalaya are 85 yrs and 1 mm/yr (Chorabari), and 72 yrs and 0.66 mm/yr (Dokriani) respectively[3,4].

A growth rate of 1.47 mm/yr was established and a colonization period of 18 yrs was set by walking lines of monuments starting with the most recent and noting the date of the stone carrying the first identifiable propagule and adding 6 months to the date to allow for delay in stone erection after burials[5].

Table 1. Colonization delay and growth rate of lichens in different parts of Himachal Pradesh[2]

Location	Colonization delay (yrs)	Growth rate (mm/yr)
Sanjoli, Shimla	24	0.73
Kanlog, Shimla	68	0.79
Dharamshala	50	0.56
Dalhousie	86	0.54

Joshi and Upreti[1] have not considered published values of Himalayan glaciers and have calculated their dates on the basis of growth rate (without considering the colonization delay), as calculated by Hansen[6] in a study of the Mittivakkat Glacier on Ammassalik Island, South East Greenland. According to him, the average radial growth of *Rhizocarpon geographicum* is about 12 mm/century or 0.2 mm/yr under optimum conditions in the proglacier valley. The species is rather indifferent as regards the aspect of the rock facets in the study area.

According to Joshi and Upreti[1], the boulders located 1 km away from the terminus of the glacier with lichen thallus diameter ranging between 110 and 120 mm resulted in the calibration of minimum age of exposure of the boulders as 550–600 yrs. According to the values of colonization delay and growth rate of the two Himalayan glaciers, as the Pindari Glacier is also a part of it, the dates of the lichens measured by them turns out to be:

110/0.66 + 72 = 239, 120/0.66 + 72 = 254 yrs (according to the values of Dokriani Glacier),

110/1 + 85 = 195, 120/1 + 85 = 205 yrs (according to the values of Chorabari Glacier).

Since Pindari is also a south-facing glacier like the Chorabari Glacier, the dates calculated by parameters of the latter appear to be more correct compared to the values for the Dokriani Glacier. This suggests that the boulders of these moraines are the part of second phase of advance and retreat of the Himalayan glaciers.

1. Joshi, S. and Upreti, D. K., *Curr. Sci.*, 2010, **99**, 231–235.
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6. Hansen, E. S., *Geogr. Tidsskr. Dan. J. Geogr.*, 2008, **108**, 143–151.

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Dynamics of Pindari glacier during the last 600 years

A recent publication[1] dealing with the lichenometric study of Pindari glacier suggests that the Pindari glacier has not advanced since the last 600 years. This has been inferred on the basis of growth of lichen *Rhizocarpon geographicum*, along a traverse from Babaji's Kutia up to Zero Point. We have been working on the palaeogeographic reconstruction and glaciogeomorphic evolution of Pindari glacier area since the last three years. Based on our field observations and relationships, we have established the chronology of glaciations in the Pindar valley in time and space[2]. The article suggests the presence of Pindari glacier at the location of Babaji's Kutia around 550–600 yrs BP. On the contrary, our detailed geomorphic studies aided with optically stimulated luminescence and ^{14}C dates have helped in understanding the dynamics of Pindari glacier in time and space. Our studies show that the Pindari glacier had vacated the Lichenometric traverse path[1] long ago around 7.0 ka BP. The misidentified moraines of Pindari glacier (referred to as substrate) are in fact much recent reworked glacial till material that has been brought by the debris cones coming out of the tributary hanging valleys.

Lichenometry, no doubt is a good tool for determining the age of morainic deposits[3]. However, one must have a thorough understanding as to what we are dating! In the present work[1], the geomorphic disposition of the area has not been considered. The authors inadvertently seem to have followed an earlier terminology[4] and have carried out their studies on reworked glacial till material of the tributary glaciers rather than the moraine of Pindari trunk glacier. The inferences based on such studies are bound to further complicate the issues of Himalayan glacier dynamics.

Our studies[2] based on the presence of set of recessional moraines in the Pindari trunk valley further show that the Pindari glacier had advanced during the Little Ice Age (around 400–500 yrs BP). Thereafter, it has been receding at a steady rate.

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