

CSIR Young Scientist Awards: an indicator of performance and promise

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The Council of Scientific and Industrial Research (CSIR) through its 37 laboratories provides a unique platform to the young scientists to pursue state-of-the-art research in the diverse disciplines of science and technology. This article examines the research output of scientists nominated for CSIR Young Scientist Award and its recipients during the period 2010–2013, based on their publications and citations. Though all the nominees are accomplished scientists, total research papers published and citations received per paper are in general higher in case of the awardees. Furthermore, awards received by a laboratory in disciplines other than its domain area indicates interdisciplinary research approach of the CSIR laboratories.

Keywords: Citations, interdisciplinary research approach, publications, young scientist awards.

THE Council of Scientific and Industrial Research (CSIR), comprising 37 state-of-the-art research laboratories and 3852 research scientists¹, is recognized for its research and development (R&D) knowledge-base and innovative contribution in a wide range of disciplines in science and technology (S&T). Though CSIR scientific staff constitute only 3–4% of India's scientific manpower, they contribute to 11% of the country's scientific output in terms of research publications².

The CSIR Young Scientist Award (YSA) scheme was instituted in 1987 to recognize contributions made by its young scientific staff with upper age limit of 35 years, with the objective to promote and recognize in-house excellence in various fields of S&T. Over the years the CSIR YSA scheme has achieved significance as out of 163 awardees till date, 16 have been recognized with the prestigious Shanti Swarup Bhatnagar (SSB) Prize, the most coveted S&T prize in the country. Presently, the CSIR YSA carries a cash prize of Rs 50,000, a citation and a plaque and is given in five disciplines, viz. biological sciences; chemical sciences; earth, atmosphere, ocean and planetary sciences; engineering sciences, and physical (including instrumentation) sciences. The awardees are also given a special incentive of Rs 7,500 per month till the age of 45 years and a research grant up to Rs 5 lakhs per annum for a period of five years to independently carry out research.

Objective

The focus of this study is to examine the research output of CSIR Young Scientist awardees with those nominated for the award during the period 2010–2013 in terms of publications in *SCI* journals and citation analysis. Interdisciplinary approach of the CSIR laboratories is observed through the number of CSIR YSAs received in various disciplines other than their domain area since the inception of the award.

Methodology and data source

The publication output of the scientists nominated during the period 2010–2013 for CSIR YSA was determined from the nominations received. The research papers published during the previous five years from the year of their nominations and the citations received, determined using *Web of Science (WoS)*, are considered. Papers presented in conferences and chapters in books have not been considered. The parameters taken into account for the study are total papers published, total citations received, citations per paper and research papers published with more than 10 citations.

Analysis and discussion

Since the inception of the CSIR YSA in 1987, 163 scientists (including 21 women scientists) have received the award till 2013. Majority of the recipients are in the engineering sciences discipline (39); followed by chemical sciences (36); earth, atmosphere, ocean and planetary sciences (34); biological sciences (29), and physical

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GENERAL ARTICLES

Table 1. Discipline-wise number of CSIR Young Scientist awardees from CSIR laboratories (1987–2013)

Biological sciences (29)	Chemical sciences (36)	Earth, atmosphere, ocean and planetary sciences (34)	Engineering sciences (39)	Physical sciences (25)
CDRI, Lucknow (6)	IICT, Hyderabad (11)	NGRI, Hyderabad (15)	NML, Jamshedpur (9)	NPL, New Delhi (16)
CCMB, Hyderabad (5)	NCL, Pune (8)	NIO, Goa (13)	NCL, Pune (8)	NCL, Pune (2)
IGIB, Delhi (5)	CSMCRI, Bhavnagar (5)	CIMFR, Dhanbad (2)	CGCRI, Kolkata (5)	NAL, Bangalore (2)
CIMAP, Lucknow (4)	IMMT, Bhubaneswar (3)	IICT, Hyderabad (1)	NAL, Bangalore (4)	CGCRI, Kolkata (1)
IITR, Lucknow (2)	CECRI, Karaikudi (2)	CSMCRI, Bhavnagar (1)	CLRI, Chennai (3)	IMMT, Bhubaneswar (1)
IMT, Chandigarh (2)	CLRI, Chennai (2)	NML, Jamshedpur (1)	IICT, Hyderabad (2)	CBRI, Roorkee (1)
IHBT, Palampur (1)	CDRI, Lucknow (1)	FPI, Bangalore (1)	NPL, New Delhi (2)	CEERI, Pilani (1)
IICB, Kolkata (1)	IGIB, Delhi (1)		IIP, Dehradun (2)	CSIO, Chandigarh (1)
IIM, Jammu (1)	NEIST, Jorhat (1)		CIMFR, Dhanbad (1)	
CSMCRI, Bhavnagar (1)	NIIST, Thiruvananthapuram (1)		NIIST, Thiruvananthapuram (1)	
NCL, Pune (1)	NPL, New Delhi (1)		CFTRI, Mysore (1)	
			SERC, Chennai (1)	

Discipline-wise number of CSIR Young Scientist awardees from each laboratory is shown in parenthesis.

Table 2. Year-wise publication output and citations received by the nominees and recipients of CSIR Young Scientist Award (YSA)

Year	Nominations	Total papers	Total citations	Citations/paper	Papers >10 citations
2010	33	468	1496	3.20	42
2011	43	613	2502	4.08	69
2012	48	684	3407	4.98	111
2013	50	699	3605	5.15	125

sciences, including instrumentation (25) (Table 1). Discipline-wise ranking of the CSIR laboratories indicates that maximum CSIR YSAs are received by scientists from the Central Drug Research Institute (CDRI), Lucknow in biological sciences; Indian Institute of Chemical Technology (IICT), Hyderabad in chemical sciences; National Geophysical Research Institute (NGRI), Hyderabad in earth, atmosphere, ocean and planetary sciences; National Metallurgical Laboratory (NML), Jamshedpur in engineering sciences and National Physical Laboratory (NPL), New Delhi in physical sciences, including instrumentation (Table 1).

The nominations for CSIR YSA are proposed by the Directors, Chairmen of the Research Council of CSIR laboratories and Bhatnagar awardees belonging to the CSIR laboratories with which they are associated. During the period 2010–2013, 174 nominations of the scientists working in 35 CSIR laboratories under five broad disciplines were considered for the CSIR YSA. Thirty scientists have been recommended by the Advisory Committee for their outstanding contributions through the work done primarily in India during the last five years preceding the year of the award.

Publication output and citations received by the nominees and awardees

Though the number of nominations increased from 33 to 50 and total research papers published by the nominees

from 468 to 699 during the period 2010–2013, the total research papers published per scientist remained almost the same, whereas the citations received per paper increased from 3.20 to 5.15, and research papers with more than 10 citations increased from 42 to 125 (Table 2). On an average, each CSIR Young Scientist awardee published 15.57 research papers with 99.13 citations, in contrast to 13.87 research papers published with 55.81 citations per nominee (Table 3). Research publications with more than 10 citations and citations received per paper were also higher in the case of awardees.

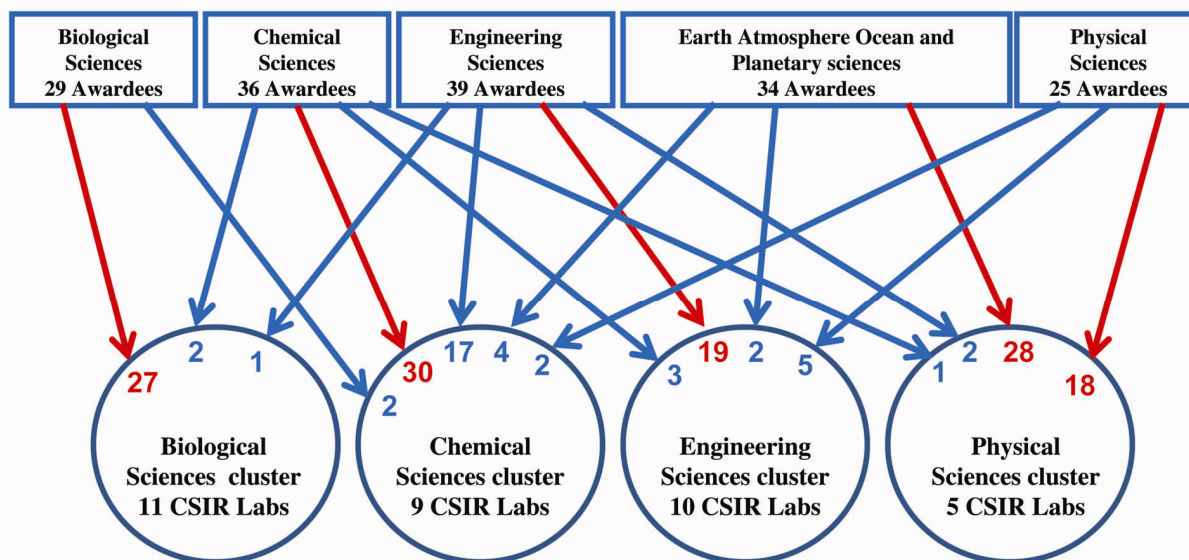
Interdisciplinary research approach of CSIR laboratories

The CSIR laboratories are classified into five clusters, namely biological sciences, chemical sciences, engineering sciences, information sciences and physical sciences. Out of 163 CSIR Young Scientist awardees till date, 122 received the award in the broad area of research of their laboratories, whereas 41 received the award in disciplines other than the broad area of the laboratory with which they are associated. In biological sciences, out of 29 Young Scientist awardees, 2 are from the chemical sciences cluster CSIR laboratories, whereas out of 36 awardees in chemical sciences, 2 are from the biological sciences cluster, 3 from the engineering sciences cluster and 1 from physical sciences cluster laboratory. Similarly, out of 39 awardees in engineering sciences, 17 are from

Table 3. Publication output and citations received by the nominees and recipients of CSIR YSA (2010–2013)

	Total papers	Total citations	Citations/paper	Papers >10 citations
Nominees	144	1997 (13.87)	8036 (55.81)	271 (1.88)
Awardees	30	467 (15.57)	2974 (99.13)	76 (2.53)

Total number of research papers published and citations received per nominee/awardee are shown in parenthesis.



Council of Scientific and Industrial Research (CSIR) national laboratories - Cluster-wise classification

Biological sciences

Centre for Cellular and Molecular Biology (CCMB), Hyderabad
 Central Drug Research Institute (CDRI), Lucknow
 Central Food Technological Research Institute (CFTRI), Mysore
 Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow
 Institute of Genomics and Integrative Biology (IGIB), Delhi
 Institute of Himalayan Bioresource Technology (IHBT), Palampur
 Indian Institute of Chemical Biology (IICB) Kolkata
 Indian Institute of Integrative Medicine (IIIM), Jammu
 Indian Institute of Toxicology Research (IITR), Lucknow
 Institute of Microbial Technology (IMT), Chandigarh
 National Botanical Research Institute (NBRI), Lucknow

Chemical sciences

Central Electrochemical Research Institute (CECRI), Karaikudi
 Central Institute of Mining and Fuel Research (CIMFR), Dhanbad
 Central Leather Research Institute (CLRI), Chennai
 Central Salt and Marine Chemical Research Institute (CSMCRI), Bhavnagar
 Indian Institute of Chemical Technology (IICT), Hyderabad
 Indian Institute of Petroleum (IIP), Dehradun
 National Chemical Laboratory (NCL), Pune
 North East Institute of Science and Technology (NEIST), Jorhat
 National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram

Engineering sciences

Advanced Materials and Processes Research Institute (AMPRI), Bhopal
 Central Building Research Institute (CBRI), Roorkee
 Central Glass and Ceramic Research Institute (CGCRI), Kolkata
 Central Mechanical Engineering Research Institute (CMERI), Durgapur
 Central Road Research Institute (CRR), New Delhi
 Institute of Minerals and Materials Technology (IMMT), Bhubaneswar
 National Aerospace Laboratories (NAL), Bangalore
 National Environmental Engineering Research Institute (NEERI), Nagpur
 National Metallurgical Laboratory (NML), Jamshedpur
 Structural Engineering Research Centre (SERC), Chennai

Physical sciences

Central Electronics Engineering Research Institute (CEERI), Pilani
 Central Scientific Instruments Organisation (CSIO), Chandigarh
 National Geophysical Research Institute (NGRI), Hyderabad
 National Institute of Oceanography (NIO), Goa
 National Physical Laboratory (NPL), New Delhi

Figure 1. Cluster-wise distribution of CSIR Young Scientist Awardees (1987–2013).

the chemical sciences cluster, 2 from the physical sciences cluster and 1 from the biological sciences cluster laboratories. Out of 34 awardees in earth, atmosphere, ocean and planetary sciences, 4 are from the chemical sciences

cluster and 2 from the engineering sciences cluster laboratories. Whereas amongst 25 awardees in physical sciences, 2 are from the chemical sciences cluster and 5 from the engineering science cluster CSIR laboratories (Figure 1).

Relative distribution of CSIR Young Scientist awardees from different science cluster laboratories to the total awards in each discipline indicates that CSIR laboratories not only excel in the broad areas of their research, but also encourage interdisciplinary approach to address emerging issues in S&T.

Various awards like INSA Medal for Young Scientists, NASI–Young Scientist Platinum Jubilee Award, Department of Biotechnology (DBT) Innovative Young Biotechnologist Award (IYBA) and Indian National Science Congress (ISCA) Young Scientists Award have been instituted over the years by science departments and science academies to promote and reward talented young scientists who have made notable research contribution in S&T, on the basis of work carried out in India. CSIR YSAs are limited to CSIR scientific staff and have been instituted with the objective to promote in-house excellence and motivation to continue to excel in the chosen area of research. CSIR applies stringent criteria for assessing the nominations for CSIR YSA. Citation count of the research papers published, journals where the research papers have been published, peer-review comments from distinguished scientists in the area of research, presentation of research work by the nominees and the discussion thereon are taken into consideration by the concerned Advisory Committee comprising eminent scientists, while recommending for the award with an ultimate objective to identify potential leaders in science. About 10% of the CSIR Young Scientist awardees till date have been bestowed with the prestigious Shanti Swarup Bhatnagar Prize in S&T and many of them are strong contenders for such recognition.

Over the years, the proliferation of awards with differing age restrictions has ensured that the dividing line between promise and performance has become extremely blurred. The prestige and credibility of most awards are determined by the accomplishment of the awardees³. CSIR YSA aims at enabling the awardees in achieving scientific advancement at an early age⁴. An independent research grant for a period of five years to CSIR Young Scientist awardees acts as a catalyst to achieve scientific advancement. Efforts are also being made by the CSIR Human Resource Development Group to nurture newly recruited scientists in universities and R&D institutions with their first research grant through extramural research schemes of CSIR, thereby fulfilling its primary responsibility of fostering young researchers in S&T institutions, including universities.

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