

Mapping INSA fellowship to research area performance

There are several learned societies or academies of science in India. These were set up to promote science in the country and to harness scientific knowledge for the cause of humanity. Since academies are an association of elected members, it is important that the best and most eminent be elected to these bodies. Also, it is important that all areas be equitably represented, but often these representations are uneven and rarely provide justice to the various sections.

Work^{1,2} on the research trends in the country using an excellence mapping approach³⁻⁵ highlighted the following:

‘It would seem from this that India concentrates its strengths and its research institutions in the physical sciences and engineering sectors, and only a token presence is seen in the life sciences, medical and biotechnology sectors. There seems to be no visible output at the highest levels regarding the attention it needs to give to various social and economic challenges.’

‘India’s research base is completely skewed towards the Physical Sciences and Engineering with very little for Biological Sciences and Medicine and

virtually none in Social Sciences and Arts and Humanities when excellence at the highest level is considered.’

Broadly, in physical sciences and engineering, nearly ten times as much work is done as in life sciences, etc. if the *F*-score or *X*-score¹ is used as a measure of activity in the corresponding area(s). We can now apply these protocols to compute *X*-scores from the various major areas of research obtained from the latest version of Excellence Maps v2 (excellencemapping.net) (accessed during June 2021) and match them as far as possible to the

Table 1. Mapping of total activity in various areas and fellowship count of the corresponding sections of the Indian National Science Academy (INSA)

Section	INSA		X-score EM v2 2012–2016		
	Count	Count	Area	X	X
Agricultural sciences	56	116	Agricultural and biological sciences	12,830.40	12,830.40
General biology	60				
Chemistry	131	131	Chemistry	39,430.01	39,430.01
Earth and environmental sciences	65	65	Earth and planetary sciences	9,072.53	20,750.45
			Environmental science	11,677.92	
Engineering and technology	102	102	Engineering	125,404.19	257,785.11
			Chemical engineering	23,388.40	
			Materials science	55,276.01	
			Computer science	42,473.91	
			Energy	11,242.59	
Mathematical sciences	73	73	Mathematics	19,218.70	19,218.70
Physics	138	138	Physics and astronomy	140,659.02	140,659.02
Molecular and cellular biology	63	160			17,565.22
Biomolecular, structural biology and drug discovery	97		Biochemistry, genetics and molecular biology	17,565.22	
Health sciences	118	118	Medicine	71,892.51	85,903.68
			Immunology and microbiology	1,745.92	
			Pharmacology, toxicology and pharmaceuticals	12,265.26	

Table 2. Total activity from excellence mapping in various areas and fellowship count of the corresponding sections of INSA arranged for drawing the Lorenz curve

Section	INSA	EM 2012–16		Cumulative count	Cumulative X
	Count	X	X/count		
Engineering and technology	102	257,785.11	2,527.30	1.00	1.00
Physics	138	140,659.02	1,019.27	0.89	0.57
Health sciences	118	85,903.68	728.00	0.73	0.33
Earth and environmental sciences	65	20,750.45	319.24	0.60	0.18
Chemistry	131	39,430.01	300.99	0.53	0.15
Mathematical sciences	73	19,218.70	263.27	0.39	0.08
Agricultural sciences + general biology	116	12,830.40	110.61	0.31	0.05
Molecular and cellular biology + biomolecular, structural biology and drug discovery	160	17,565.22	109.78	0.18	0.03
Total	903	594,142.59	657.97	0.00	0.00

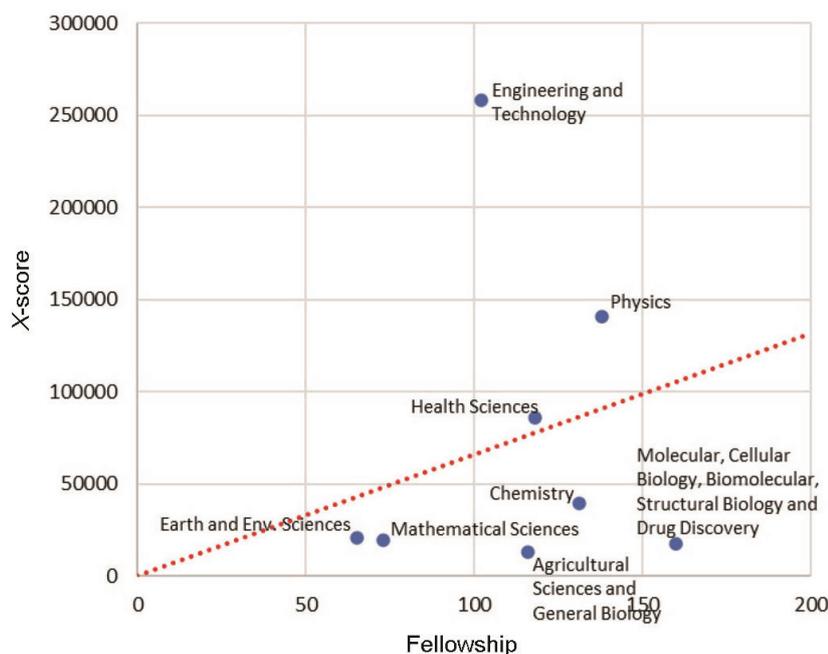


Figure 1. Scatter plot of the X-score for major areas and the corresponding fellowship count of eminent academicians elected to that sectional committee.

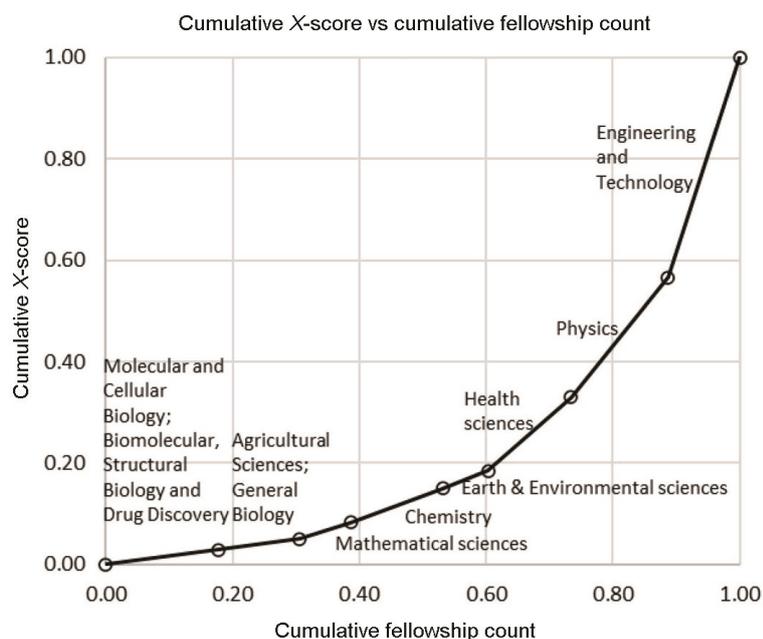


Figure 2. The Lorenz curve showing cumulative total activity from excellence mapping in various areas and the cumulative fellowship count of the corresponding sections of INSA.

fellowship count of academicians elected to that Sectional Committee of a leading science academy, the Indian National Sci-

ence Academy (INSA) (Table 1). INSA has recently reclassified its fellowship into ten areas and this classification is

used here. The dispersion between X-score and count of fellows in the respective section is displayed in Figure 1 as a scatter plot. The dashed red line shows an academy average. We see that the engineering and technology discipline is grossly under-represented, while there are other disciplines that are correspondingly over-represented. Only health sciences is close to the average.

This can be best visualized using a Lorenz curve. In Table 2, we arrange the total activity computed as X-values from excellence mapping in various areas and the fellowship count of the corresponding sections of INSA to facilitate the drawing of the Lorenz curve. Figure 2 is the Lorenz curve showing cumulative total activity from excellence mapping in various areas and the cumulative fellowship count of the corresponding sections of INSA. Engineering and technology contributes to 43% of the scientific output at the level captured by excellence mapping (top 10% of cited articles), but makes up for only 11% of those elected to INSA. At the other end of the scale, the two sections covering molecular and cellular biology, and biomolecular, structural biology and drug discovery, together account for 18% of the INSA fellowship, but contribute only 3% of India's scientific output at this level.

1. Prathap, G., *Curr. Sci.*, 2016, **111**(3), 470–474.
2. Prathap, G., *Scientometrics*, 2017, **110**(3), 1085–1097.
3. Bornmann, L., Stefaner, M., de Moya Aneón, F. and Mutz, R., *Online Inf. Rev.*, 2014, **38**(1), 43–58.
4. Bornmann, L., Stefaner, M., de Moya Aneón, F. and Mutz, R., *J. Informetr.*, 2014, **8**(3), 581–593.
5. Bornmann, L., Stefaner, M., de Moya Aneón, F. and Mutz, R., *COLLNET J. Scientometr. Inf. Manage.*, 2015, **9**(1), 61–68.

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