collective self, rather than fostering individuality. In this set-up we grow with a loss of self and learn to subsume our worth as an individual.

Family relationships also help the members in their future life, like in finding jobs or even getting a promotion or other accomplishments, with the result that an Indian has internalized his 'familial and social position' in his family and has become highly hierarchical in his social attitudes. Thus he is culturally tuned to uphold the family integrity rather than his individual strength and creativity. This is a radical departure from the Western cultural values. The Kakars further say that these patterns of family life provide the template for the relationships in our university departments, scientific institutions, political parties and bureaucracy and thus in contrast to the West, Indians are more prone to revere than admire. This authoritarian familial social structure tends to kill individual brilliance and excellence. Is this the reason that Indian scientists who have gone abroad and out of the earshot of Indian cultural ambience are apparently doing much better than the indigenous researchers?

Interestingly, an article on Chinese performance in science, which was published in *Nature*[4] a few years ago, also accuses cultural factors such as conformity and respect for authority as the impediments to excellence[5]. Maybe some of these cultural attributes are Asian rather than Indian, as the Chinese are steeped in Confucian ethos[6]. The point is, as Mashelkar raises, these countries have to free themselves from the cultural chains of the past to foster original scientific research. This social change will come about as a result of increased urbanization, growth of nuclear families and women empowerment. It will take a whole generation to bring about the change. But then, there will be a trade-off: the rise of individualism will lead to the decay of a great social security system for the less fortunate and the elderly, which is what the biological function of an Indian joint family is.

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Scientometric comparison of Indian institutions with other international institutions: a *iCX* map representation

A comprehensive and meticulous scientometric comparison of Indian institutions with other international institutions from the US and Asia was reported recently[1]. The publication profiles of many science and engineering departments of top Indian institutions were compared with those from similarly placed institutions in the US and Asia on a 'per faculty per year' basis. Indian universities do not compare favourably with their counterparts in Asia or the US.

The performance assessment in ref. 1 can be projected in a simple fashion using what is called the *iCX* approach. For

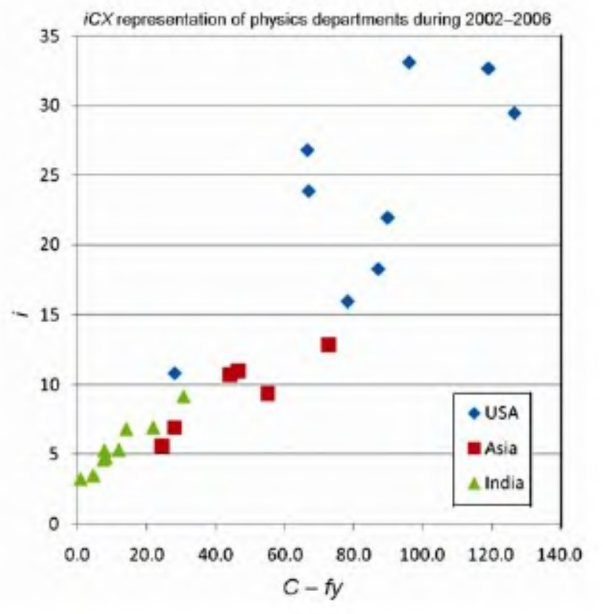

Figure 1. An impact-citations–exergy projection of various physics departments from top institutions in the US, Asia and India.

Table 1. *iCX* analysis of various physics departments in top institutions in the US, Asia and India during 2002–2006 (after table 6 of ref. 1)

Country/region	Institution	*P*	*C*	*h*	*p*	Faculty strength	*P* – *fy*	*C* – *fy*	*i*	*X* – *fy*
USA	UCB	1934	63,138	102	127.26	106	3.6	119.1	32.65	3889.10
	MIT	1801	59,578	93	125.38	124	2.9	96.1	33.08	3178.82
	UTexas	1697	27,025	64	75.50	69	4.9	78.3	15.93	1247.47
	PSU	1411	25,743	71	77.73	59	4.8	87.3	18.24	1592.10
	MSU	1230	26,979	63	83.96	60	4.1	89.9	21.93	1972.54
	Caltech	1183	34,829	79	100.84	55	4.3	126.7	29.44	3728.76
	OSU	1124	26,799	61	86.13	80	2.8	67.0	23.84	1597.39
	UMinn	1057	28,307	65	91.18	85	2.5	66.6	26.78	1783.71
	Purdue	771	8,334	39	44.83	59	2.6	28.3	10.81	305.37
Asia	Osaka Univ	1949	21,380	57	61.67	92	4.2	46.5	10.97	509.85
	Tsing Hua Univ	1547	10,712	37	42.02	76	4.1	28.2	6.92	195.19
	Seoul Natl Univ	1271	16,356	51	59.48	45	5.6	72.7	12.87	935.46
	Natl Taiwan Univ	1207	11,289	46	47.26	41	5.9	55.1	9.35	515.05
	Natl U S'pore Univ	1135	12,138	42	50.63	55	4.1	44.1	10.69	472.03
	Kyushu Univ	806	4,519	26	29.37	37	4.4	24.4	5.61	136.96
India	Saha Inst	973	6,750	32	36.04	62	3.1	21.8	6.94	151.05
	IISc	683	6,277	32	38.64	41	3.3	30.6	9.19	281.40
	IIT-D	387	1,842	17	20.62	46	1.7	8.0	4.76	38.12
	IIT-K	367	2,504	19	25.76	36	2.0	13.9	6.82	94.91
	IIT-KGP	319	1,700	18	20.85	29	2.2	11.7	5.33	62.48
	IIT-M	271	1,432	17	19.63	38	1.4	7.5	5.28	39.83
	IIT-B	267	1,231	16	17.84	34	1.6	7.2	4.61	33.39
	IIT-R	127	440	9	11.51	20	1.3	4.4	3.46	15.24
	IIT-G	27	87	5	6.54	22	0.2	0.8	3.22	2.55

example, the datasets shown in table 6 of ref. 1 can be re-arranged as shown in Table 1. On a per faculty per year (*fy*) basis, the number of publications and citations during 2002–2006 are designated by $P - fy$ and $C - fy$. Then, the quality (impact) term becomes i, where $i = C/P = C - fy/P - fy$. An energy-like term (we call it exergy, defined as $X = iC = C^2/P$) is computed for the various physics departments belonging to institutions in the US, Asia and India, again on a per faculty per year basis. A two-dimensional map can then be drawn as shown in Figure 1. In exergy terms (a measure that now combines quality and quantity), institutions in the US are far ahead of those in India (by order(s) of magnitude) and this is graphically conveyed in the *iCX* map.

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Changing face of agricultural education

The views and concerns expressed by Shah and Sepat[1] are timely and realistic, as majority of the agricultural colleges are understaffed. I would like to add a couple of points which also have a role in deciding the quality of agricultural education. More often than not, the Vice-Chancellors of State Agricultural Universities (SAUs) are either eminent researchers or research administrators, whose priorities expectedly weigh more towards research than teaching. In addition, unlike in teaching, the research outputs, in the form of publications, technologies or crop varieties, are visible and quantifiable, thus prompting scientists to prefer research to teaching. Hence the universities should have well-placed personnel management policies to take care of the aspirations of the staff and the requirements of the students. Under any circumstances teaching should be the first priority and SAUs should not forget the fact that teaching is their main mandate, as ICAR has a strong network of research institutions all over the country to cater to research needs.

Another disturbing trend affecting the quality of education is the indiscriminate creation of new universities and colleges without providing adequate infrastructure, facilities and manpower. In some states (for example, Andhra Pradesh and Karnataka) horticulture has been separated from agriculture and given the university status. This move deprives agricultural graduates the chance of acquiring holistic knowledge on all crops. What will be their competence when they are approached for advice by a farmer who cultivates both paddy and vegetables? This ultra specialization has permanently changed the very meaning of the term 'agriculture'.

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