Institute of Technology[2]! So, will it be necessary for students who wish to escape the tedium of some of the current Bachelor's courses to subject themselves to topics they have no talent and interest in? Would more choice help the situation?

Another point of view can be borrowed from Amartya Sen, who, in the context of primary education, has commented that a bad education is better than no education. Will even a poorly understood, or meagrely enjoyed, Bachelor's degree in the multiple disciplines be better than the monolithic programmes commonly encountered in the country today? For an answer we may have to wait for a few batches of students to complete their degree programme.

1. Joint Science Education Panel, Appendix III of the Position Paper on Restructuring post-school science teaching programmes', Indian Academy of Sciences, Bangalore, October 2008,

2. Feynman, R. P. and Leighton, R., *Surely You're Joking, Mr Feynman* (*Adventures of a Curious Character*), Vintage, 1992, p. 36.

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When do we learn to properly advertise a post?

How well qualifications and job specifications are mentioned for a post in *Nature* and *Science*. For positions involving teaching, candidates are asked to submit a detailed teaching statement and philosophy, from their past services and for the future. The theory and laboratory courses to be taught and developed at various levels, viz. UG, PG, majors, non-majors, etc. semester-wise are clearly stated. Candidates are asked to mention their career objectives. On the research side the expertise required, areas to be developed, approaches to be used, technical and instrumentation skills required, goals to be accomplished, involvement of UG and graduate students in the research programmes, etc. are clearly stated. Further, even attitudinal requirements like unflappable temperament, impeccable interpersonal skills, commitment to UG teaching, quality of mind, etc. are mentioned. The responsibilities of the candidates and division of time and labour towards various activities like actual benchwork to be done, teaching of courses, supervision, etc. are indicated.

Another important component of foreign advertisements is that they also mention, right in the advertisement, what the institute is going to offer to the selected candidate in terms of office and laboratory space, equipment, start-up funds, annual operating budget, personal administrative support, etc.

In striking contrast are advertisements in our media, which are too flexible. As a result, candidates from a wide variety of backgrounds stake a claim. It is high time that apex bodies give necessary instructions to universities, etc. to advertise posts with clear-cut requirements.

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Earth science technology courses

The editorial by Balaram[1] on 'The science of the earth' encompasses, compelling demand to replace earth science classical and traditional study with modern scientific concepts. His concerns are: few takers; work of the National Institutions most often does not seem in tune with international mainstream community; present scenario is a matter of serious concern; sudden emergence of meeting ground for a diverse array of interest groups, etc. Hence, modern programmes in our best institutions are worth considering. The well-articulated reawakening call of Narasimhan[2] on 'Dimensions of earth education', had succinctly enumerated and reiterated various facets presently relevant to India, with special emphasis on earth education. Ramanamurthy[3] has outlined 3D mapping at great depths by observing geological processes in real time, under the auspices of the Earth Scope Project, funded by the US National Science Foundation (operational by fall 2008).

Earth sciences is a natural science. Ever since civilization started humans have been observing nature's variations along with its manifestations, and the utility of this treatise which has been put to use since then. That is how, for example, based on surface reflections of anomalous variations, several mineral deposits were discovered and exploited. Such 'old workings' serve as direct indicators for geologists of the modern era. Ancient Indians had also developed appropriate technologies in mining, mineral processing and metallurgy. In due course of time earth sciences was christened as 'geology'. However, the fundamentals were based on traditional observation of nature.

Not being a pure science, the scientific foundation of geology was laid with the application of the doctrine of basic sciences as enunciated in physics, chemistry, botany and zoology. Further, in-depth, need-based applications had given birth to various sub-disciplines like geophysics, geochemistry, geobotany, including palaeobotany and palaeontology. Application of engineering expertise and technological adoptions is helpful for practising professionals. The major prospecting 'old working' surface indicators have almost exhausted. Hence survey of mineral

resources location needs indirect tools involving latest neo and nano technologies regime. This aspect warrants genesis of a new curriculum.

Those who had specialized in the sub-disciplines and traditional geologists have been at loggerheads. This is a setback to the professional earth exploration activity and academic R&D of inter- (sub) disciplinary approach, involving multi-dimensional parameters and poly-componential indicators. This situation had prompted me to suggest remedial measures for circumventing these lacunae, so that generalists and specialists of earth sciences could think collectively and work for the general good.

The medical education system is worth emulating for the betterment of the earth education system, in an endeavour to accomplish the envisaged cardinal objective of a much needed and value-added education. As such, parallelism is drawn.

The present optional subject of geology among three subjects in B Sc and M Sc degree programmes without professional orientation is to be replaced with a 4-year B Tech degree in earth sciences technology. In addition to the various sub-disciplines of geology (pure geology, geophysics, geochemistry, etc.), the course must include the essentials of technology courses like mathematics, physics, chemistry, engineering design and drawing, etc. This B.Tech degree would be the graduation course for earth science technology (just like a graduate medical degree in medical sciences), for further specializations at PG (M Tech) and Doctoral (Ph D) levels. Integrated graduate (and postgraduate) education leading to Ph D and admission into Ph D programmes directly after graduation should also be possible. The graduation programme should be enough for general practice of geology, like graduate medical doctors. Specializations and super-specializations will strengthen the system.

As of now, admission of geology graduates into M Sc (Tech) or M Tech in applied geology, mineral exploration or geophysics is in vogue in many Indian universities, ISM and IITs. This indicates that application of geological knowledge has inbuilt engineering and technological components. At M Tech level, specialized engineering skills consisting of integration of specific branches of engineering, for earth exploration and exploitation also need to be introduced. Academic, research and professional institutions should evolve as schools of research excellence of reputation in each super-specialization. Deemed university status should be accorded, wherever necessary.

In conclusion, while designing the curriculum, one has to take care of the industry need. Examinations should be oriented to solve a given field problem with the blend of academics and professionalism. The teaching should include interaction with experienced professionals from the industry, an important issue which is neglected. The contribution of the Indian mining and mineral-based industries is 'nil' for earth sciences education. This needs to be changed. Creation of interest in earth sciences technology education and field work with a good blend of professionalism and academics is the need of the hour, as almost all the surface manifestations for prospecting have been exhausted, thus warranting a new curriculum with modern technology regime to address this issue. There is acute shortage of good professionals and academicians in earth sciences. This situation needs immediate redressal to cope up with the ever-increasing natural resources demand. It is needless to state that suitable reorientation of the curriculum is an absolute, immediate necessity, followed by other rectification methods like suitable remuneration, attractive perks and family separation allowances for teachers and professionals, and attractive stipend for students and research scholars.

1. Balaram, P., *Curr. Sci.*, 2005, **88**, 5–6.
2. Narasimhan, T. N., *Curr. Sci.*, 2008, **95**, 578–581.
3. Ramanamurthy, M. V., *J. Geol. Soc. India*, 2007, **69**, 1379.

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Amazing events in SKR's life and the men behind them

I have read the obituary of S. K. Rangarajan (henceforth referred to as SKR, the name he was popularly known by), published in *Current Science*[1] with great interest. As stated there, SKR started his career as a film critic, changed a number of jobs, and finally evolved as a Distinguished Professor at the Indian Institute of Science (IISc), Bangalore and later at the Institute of Mathematical Sciences (Matscience), Chennai. There are many amazing facts in his life and works. With only a B A (Hons) degree in mathematics, he became an Assistant Professor in mathematics in an engineering college two years after his graduation. This is quite unusual and has few parallels, as all colleges prescribe a Master's degree as the minimum qualification for a teaching position. The principal of the college must have been more than a routine administrator in recognizing the potentials of SKR.

With only a Bachelor's degree, for SKR to actively pursue research in special functions and publish 17 papers is also unusual. This amply illustrates the kind of genius that he was. From special functions to developing a theory of faradic rectification in the domain of electrochemistry, and that too in a couple of days, is another amazing achievement. K. S. G. Doss, the then Director of the Central Electrochemical Research Institute (CECRI), Karaikudi, at whose request SKR solved this problem, was quick to recognize the talents of this man and was bold enough to offer him a scientist's position at his institute. Doss must have broken all rules of CSIR to offer a scientist's position in electrochemistry to a Bachelor's degree holder in mathematics, for which, again, a Master's degree in the relevant field must have been the minimum qualification. But SKR proved his worth by doing