

Institutional training and universities

As pointed out by Dasannacharya^{1,2}, the BARC Training School so thoughtfully established by the founder fathers of the atomic energy programme in 1957, had served a useful purpose to provide the scientific manpower needed for the DAE for the last half a century. The Argonne International School of Nuclear Science and Engineering (1955) and Oak Ridge School of Reactor Technology (1950) in USA served as the models. Many from BARC had attended these schools.

How far the transformation of this venture into a university (HBNI) will be relevant remains to be seen. Eventually it will be dictated by the trend and requirements in the area of nuclear science and technology. No doubt, it will continue to meet the original objective of the BARC Training School in providing and furthering manpower to BARC, with the difference that the graduates will have the satisfaction of having a degree with limited impact on the general academia.

The need today is to get integrated with the university structure and encourage, help and prod to involve it in training and R&D in nuclear sciences and achieve 'a horizontal interaction of BARC with universities and IITs'³, rather than insulating it from the mainstream. One of the factors for the great progress achieved by USA is the traditional tie-up of the universities with industry. The industry benefits from the human resource in the universities which in turn is sustained by the industry. Apart from the nuclear industry, such a tie-up is required if we have to build a strong industrial base for the country. That objective must be achieved, rather than diluting it.

Understandably, the stress in the HBNI will be on applied sciences and it is unlikely basic sciences will attract importance, similar to what happens in the universities at large in the country today. Even in the inception stage, some traditional science applications are placed

under engineering faculty. The pattern of HRD growth in the area of nuclear science and technology is also indicative of this trend. Further, it may not be out of place to add that there is a need to promote human resources from within the discipline concerned in preference to a generalist science management.

1. Dasannacharya, B. A., *Curr. Sci.*, 2008, **94**, 525–527.
2. Dasannacharya, B. A., *Curr. Sci.*, 2008, **94**, 1236.
3. Upadhyaya, G. S., *Curr. Sci.*, 2008, **94**, 1236.

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Brain structure could depend on the learning script

The on-line edition of the *Proceedings of the National Academy of Sciences USA* of 8 April 2008, carried an article by Li-Hai Tan, University of Hong Kong and his collaborators on differences in the manifestation of dyslexia among the English and the Chinese. It is said that millions of children worldwide are affected by dyslexia, a learning disability spectrum that can include problems in reading, spelling, writing and pronouncing words that may be carried into adulthood. Its incidence has been estimated to range from 8 to 15% of students world over.

Employing the non-invasive technique of functional magnetic resonance imaging (fMRI), the Hong Kong group had reported from earlier work that '... unlike impaired reading in English and other Western languages, impaired reading in logographic Chinese is associated with functional disruption of processes localized to the left middle frontal gyrus. Although Chinese dyslexia is manifested by a phonological deficit (i.e. graphic form to sound conversion) which is similar to dyslexia

in alphabetic languages, cortical regions mediating this deficit in Chinese and alphabetic languages are spatially separated'. This raised the possibility that because of differences in how a writing system links print to spoken language, the neural circuits involved in reading and reading disorders may vary across languages. In Chinese, graphic forms (characters) are mapped to syllables. This differs markedly from an alphabetic system (e.g. English) in which graphic units (letters) are mapped to phonemes. Examining the brain structures of select children, the researchers found that different parts of the brain develop differently, as clearly demonstrable by fMRI, depending upon whether they grew up reading English or Chinese. Reading Chinese (Mandarin, Cantonese) involves memorization of sounds to be associated with what may be called approximate pictorial representations of objects and actions in the thousands. On the other hand, the majority of world languages are said to be phonetic in that they use a limited

number of symbols, the juxtaposition or combinations of which lead to words that can be read or pronounced.

Tan's school has found, apart from actual structural differences in the development of the brain (e.g., by volume of grey matter), differences in the activities of different parts of the brain that can be perceived when children reading English or Chinese are tested.

These can lead to differences in how reading is supported in the brain. Readers of Chinese show relatively more engagement of visuospatial areas and left middle frontal regions for verbal working memory, presumably for recognizing complex, square-shaped characters whose pronunciations must be memorized by rote instead of being learned using letter-to-sound conversion rules. A recent analogy could be how certain regions of the brains of London taxi drivers, who have to memorize various routes and their alternatives in the city, develop differently from those of non-taxi driving Londoners.

It seems now clear that dyslexia differs by the mode of how a child gets the ability to read and, by implication, by the differences in the principles underlying the script (not that it 'differs by language' as the news media would have it while reporting the Hong Kong work). What has been established is that modes of brain development activity may differ in at least in two ways depending on the mode of initial training, either phonetic or logographic.

In 2001, I wrote a note in *Current Science*¹, when I learned, much to my surprise, that an astonishing 8–15% of persons are dyslexic in the English-speaking world. In contrast, near absence of dyslexia has been claimed for the more phonetically 'exact' Italian. I tried to draw the attention of researchers and others interested, to a neglected area of India-based studies of dyslexia.

I began to wonder about the prevalence of dyslexia among persons who have undergone literacy training in any of the phonetically exact major Indian scripts. The scripts of major languages indigenous to India have evolved out of ancient Sanskrit thinking dating as far back as the 8th Century BPE. Their 'alphabets' (not really 'alphabets' because they do not begin with α , β ... or their variants) are arranged, uniquely to India, by the mode of pronunciation, the vowels and consonants listed separately. All of the scripts employ standard alterations/extensions to show how a vowel governs a given consonant to form a phoneme. In the North Indian scripts, writing the consonant sym-

bol and ligating it with a smaller version of the 'second' consonant represents, for example, the compounding of two consonants. Extending this with the standard alteration for a vowel leads to the principle of representing a syllable with one symbol. In some Peninsular (South) Indian scripts (Telugu, Kannada) compounding is achieved, by subscripting the 'second' consonant near the first. Tamil and Malayalam use a combination of these methods. Contrasting with the manner of serial writing in Western scripts, these Indian scripts leave no room for different ways of reading a given piece of writing – there is no 'spelling'. The method (which may differ somewhat among the different Indian orthographies) completely contrasts with the Roman and Cyrillic method of juxtaposition that may have built-in uncertainty regarding pronunciation because of limitation in the number of symbols. Continental European languages use a large number of diacritical marks in trying to represent what is said in a more phonetically exact manner.

The point I tried to make in my article was that since there is no uncertainty in the way the letters represent speech a lesser incidence of dyslexia could be possible in the Indian population. I discussed the necessary precautions that must be borne in mind while designing methods of gathering Indian data and for making statistical comparisons with data from the West.

The Hong Kong work has admirably demonstrated the differences in the brain development of children raised to read

English or Chinese. But then the 'phonetic' English (and related European) and the logographic Chinese represent two extreme variations in the manner they use the potential to convert written representation into sound. One may even go so far as to say that a difference in the brain structures of even *non-dyslexic* persons should be expected for the two extremes.

A question arises now: Can one drive a wedge between what can justifiably be termed as 'partially phonetic' European systems and the wholly phonetic and nearly exactly representative Indian system that evolved out of ancient Sanskrit thinking? A related question would be: Can differences in the brain development be demonstrated through fMRI and other non-invasive means between those trained to read exclusively in a given script native to India and those (Indians) knowing only how to read English?

India currently offers a unique opportunity to carry out the required tests and find answers to such questions. It will be an interesting investigation, even if the answers turn out to be negative.

1. Balasubrahmanyam, S. N., *Curr. Sci.*, 2001, **81**, 872.

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Sunscreens: Do they need screening?

Sunscreens and other cosmetic utilities have been flooding the personal care industry in recent years. The purpose of suntan preparations is to assist the skin in tanning without painful effects and that of anti-burn preparations is to minimize the harmful effects of sunburn. The materials used for the above purposes are known as suntanning agents and sunburn preventive agents respectively. Combined together, these are known as sunscreens¹. These formulations protect the skin from the damaging ultraviolet (UV) rays of the sun. The history of observation of human exposure to the sun and its effects dates around 1500 BC in both Egypt and India.

Ancient Egyptians used inorganic clays and mineral powders to protect their skin. The first effective sunscreen may have been developed by the chemist, Franz Greiter in 1938. In Florida, the US pharmacist, Benjamin Greene invented a sun-care product in 1944, known as coppertone sun-care cream². Greiter is accredited with introducing the concept of sun protection factor (SPF) in 1962, which has become a worldwide standard for determining the effectiveness of sunscreens when applied at an even rate of 2 mg/cm². The effectiveness of all sunscreens is rated on the SPF. The SPF explains consumers about the extent of

protection against UVB (ultraviolet B) rays. A number of sunscreens contain titanium dioxide, kaolin, talc, zinc oxide, calcium carbonate and magnesium oxide. Depending of the individual skin type, a sunscreen product protects to different extents for different individuals. Product category designation is a classification system developed for sunscreen products by the United States Food and Drug Administration, to meet the requirement of consumers with different types of skin. Some experts say that the Indian skin is already ensured for better protection against the sun. In India, sunscreens are regulated by the Drug and Cosmetic