Bhrigu-Samhita: An ancient manuscript with medical matters of interest

The debate on the inclusion of astrology, as a science subject, has been quite acrimonious and at times sanctimonious too. This is evident in several issues of *Current Science*, other technical and lay publications and in the media. A good spin-off is the distinct polarization in the academia and the vocal expression of the partisan views. Indeed, such a debate should have been first invited by the UGC, before the decision. Controversy and an evidence-based debate amongst the 'experts' is the soul of science and technology. And the eventual consensus and the majority decision are then based on information, data and the level of contended knowledge.

Unfortunately, we still continue to be Lord Macaulay's educational products. We have not yet revolutionized our memory-loaded learning into concept-based education. Hence, barring a few exceptions, most of us have no roots in the Indian scientific traditions, languages and age-old knowledge base. We have been raised on a myth that science is universal and not culturally conditioned. Some of us who have attempted to study transcultural aspects of science know better.

During my study for M.D. (Medicine), I wrote a thesis on 'The medical aspects of *Bhrigu-Samhita*' in 1963. It was a comparative study in the history of medicine. I invited the wrath of my examiners and the thesis was rejected because it was on 'Ayurveda'! But what interested me more in *Bhrigu-Samhita* were the remarkable medical descriptions in Sanskrit, on the circulation of blood, cancer, embolism, etc. I have cited some of these excerpts from the manuscript below:

- 'The windpipe must be healthy for the movement of pure and impure air to and fro from the lungs. The lungs, in turn, supply the heart with the purified blood. Then the heart circulates the blood to the entire body rather rapidly.' It is quite a statement in an old Sanskrit manuscript (*Bhrigu R II/6: 8–9*) (circa 3000 B.C. – Bhrigu Rishi).
- 'If at times, due to whatever reasons, impure blood, a blood clot, or a piece of fat were to move into the heart, during circulation, this can jeopardize the heart.' (*Bhrigu R II/7: 5–6*)
- 'The germ can also move into the bones or the seat of the heart. The disease is called by the name – *Kshaya Roga* – The germs are so virulent that via breath a rapid spread can occur from one person to another.' (*Bhrigu R III/20: 5–7*)
- 'At times even the heart will be replaced. Such devices exist in India . . . Indian scientists of a high calibre will one day replace even liver or spleen, in future.' (*Bhrigu R II/10: 1–4*)
- 'Occasionally, diabetics would benefit especially from treatment that is carried out after proper urine examination. There can be help in other diseases too by a careful urine examination.' (*Bhrigu R IV/31: 6–8*)

There is an urgent need to salvage many of our ancient manuscripts of medicine, astrology, philosophy, etc. We must conduct ^{14}C-dating to determine the period of the palm-leaf and other manuscripts. But the time has come to look seriously at our heritage in sciences and humanities, without any ancestral vain-glory or an outright rejection because, something does not fit into the western reductionist world-view.

ASHOK D. B. VAIDYA

Bhavan's S.P.A.R.C,
13th North South Road,
JVPD, Juhu,
Mumbai 400 049, India
e-mail: avaidya@bom5.vsnl.net.in

Politeness or fear of dissenting?

P. Balaram's editorials are always original, interesting, provocative and elegantly written. Unfortunately, they do not appear to attract sufficient discussion, despite the fact that such discussions would greatly enhance their value. Though I am an avid reader of these editorials, I have been remiss in not reacting to them even when I have felt the urge. I would now like to make amends by commenting on the editorial *The importance of being impolite* (*Curr. Sci.*, **80**, 1245–1246).

The editorial starts with J. B. S. Haldane's conclusion that 'science in India is developing with disappointing slowness . . . because Indians . . . are too polite'. Without going into an expatriate's conclusion almost half a century ago, the point is that Haldane has attributed to politeness the failure of Indian scientists to voice criticisms of the work of their senior colleagues and their silence, even when they differ. Being a fearless person himself, Haldane did not think of ascribing the silence to *fear* of having to pay the price of dissent (impediments to career advancement, loss of funding, privileges and perks, etc.). Most Indian scientists 'are polite about one another's work' because they are afraid of being critical. This fear is an inevitable consequence of an environment in which dissent is strongly discouraged and 'constructive criticism and debate on science' is virtually absent.

It is only when there is no fear of dissenting that the question arises of how to express the dissent. And can one recommend anything other than the most courteous and civilized forms of expression? Haldane argued that there was a 'choice between politeness and efficiency'; instead I submit that there is firstly a choice between silence and efficiency and then a choice between politeness and rudeness. Balaram, therefore, should not have emphasized 'The importance of being impolite'; he should have stressed 'The importance of polite dissent', where dissent is warranted and required.

Hence, it is not politeness that is a major impediment to the advance of science, but the absence of debate, criticism and dissent. For Indian science to flourish, what is required is a *community* of *interacting* scientists with the well-established traditions of a peer system. Without the environment of an actively interacting scientific community, there cannot be the natural selection of scientific ideas and data, which alone will ensure that the fittest theories and experiments survive. Natural selection of ideas implies competition and diversity.

It cannot arise if there is a monoculture of views. Truth cannot emerge and science cannot advance if there is an absence and/or exclusion of dissent. The standard way of avoiding genuine controversy and peer review is to exclude unorthodox views from seminars, committees, journals and other forums (including the peer-reviewing process). Underlying all this violation of the scientific tradition and its codes of behaviour is the fact, 'he who pays the piper, calls the tune'. Government and quasi-government sources are responsible for the overwhelming share of science funding, so that scientific activity depends strongly on this funding, and almost all scientists are on the government pay-roll or perk-roll. There are also a number of cash-carrying prizes and awards which act as further inducements to conform, rather than dissent.

The nuclear tests exposed this weakness of Indian science. Faced with a complexity of issues raised by the tests, it would have been natural for the body of intelligent and creative scientists to develop a spectrum of views. Instead, the virtually unanimous euphoria was astonishing. Since, it is statistically unlikely that almost the whole body of scientists had independently arrived at a single view, one cannot help suspecting that it was the fear of dissenting that explained the 'unanimity'.

AMULYA K. N. REDDY

7/12 Palace Cross Road,
Bangalore 560 020, India

Losing innocence to big science

This is with reference to the two consecutive editorials, 'Big science, small science' (*Curr. Sci*., 2001, **81**, 133–134) and 'Lost innocence' (*Curr. Sci.*, 2001, **81**, 229–230). To me, it appears that 'big science' or 'applied science' cannot come into existence unless 'small and basic science' is created first. Consequently, only 'small and basic science', or 'science' to be more precise, is the terminology that needs to be used. The editor is absolutely correct when he says, 'Would it not have been better for the academy to limit its domain to conventional academic science and avoid straying into the difficult waters of strategic science and technology'. But then, who cares for etiquette. The very fact that Balaram, a genuine scientist to the core and staunch supporter of 'basic science', himself has used the word 'big science' to describe the so-called applied science being practised under the handful of mega schemes which are eating the bulk of the meagre funds available for research these days, tells a lot about the direction of the wind. Like anything else, science has become a commodity and the importance of scientific research is not judged merely on its merit or its contribution to the welfare of mankind in the long run; instead it is judged by its glamour and apparent gains, both socio-political and otherwise. If so, the priorities are bound to be decided accordingly. No wonder, therefore, that 'big science' has robbed the naiveté of the academy.

M. Y. KHAN

Department of Biochemistry,
Dr R.M.L. Avadh University,
Faizabad 224 001, India

Social geology

Scientific temperament among the masses is a must for safety, security and prosperity of the nation. However, this faculty is uneven at the level of common man with respect to different branches of science and is particularly negligible or minimal in the case of geology. People generally rely on media coverage, accurate or inaccurate, and form opinions accordingly, about the ongoing geological processes. This situation is very alarming because of the twin nature of geology, i.e. on the one hand, once plentiful mineral resources are continuously being depleted at a relatively faster rate leading to a situation when the bountiful nature may be deprived of such precious treasures whereas, on the other hand, natural disasters, viz. earthquakes, volcanic eruptions, landslides, avalanches, flash floods, sinking of groundwater level, etc. are causing irreparable losses to the society. However, the exaggerated media coverage and reporting by the not so well-informed reporters add fuel to the fire of the public psyche.

Things are further complicated by the so-called estimated predictions about time, location and intensities of the natural calamities. For example, this is quite common with respect to earthquakes in the Himalayan and other regions or groundwater poisoning in West Bengal and Bangladesh by arsenic or groundwater depletion, particularly in the areas of intensive agricultural practices. The public is generally deprived of realistic assessment of the situation arising out of geological factors.

This sorry state of affairs can be attributed to general neglect of geology at the school level in science curricula, late commencement of study, i.e. only at the university level, resulting in a very limited number of students choosing the subject, general ignorance of safety, security and preparedness aspects in the geologic text books, lack of interaction between practitioners of geology and the masses and lack of attempt on part of the authorities to educate the citizens.

A well-informed and scientifically-equipped public, with knowledge about the pros and cons of geological processes, will be able to combat the adversaries caused by such inevitable processes. The need of the hour is to launch a new discipline called 'social geology' at all levels through formal or informal education or through social agencies, which can enlighten the public about the likely impact and proper safety preparedness for pre-, syn- and post-disaster scenario. Professional geologists and students, if trained, can play a very vital role in educating the masses, by giving rational explanation of the geological processes affecting them and the precautionary measures they should adopt to lessen the impact of calamities. Government and non-government agencies should launch campaigns to educate people and to add in the formal educational system, the approaches and methodologies of social aspects of the subject and harvest the returns in the form of protecting the society from mass devastation. Ways should also be devised to put restriction on the predictions about future events by habitual professionals, which create psychological panic in the masses.

Well goes the saying that 'Where there is a will, there is a way' and if this is practised in right earnest in promoting various programmes related to literacy, AIDS, family planning, etc. why can't we be a winner in launching the 'social geology' campaign?

A. K. BIYANI

P.G. Department of Geology,
D.B.S. (P.G.) College,
Dehradun 248 001, India
e-mail: smartddn@nde.vsnl.net.in

A synthesis of sedimentary geochemical processes in and around Carlsberg Ridge

The sedimentary geochemical environment in and around Carlsberg Ridge (CR), Arabian Sea is a subject of study for quite some time; yet there is no conclusive picture to understand the metal enrichment processes in this area. Hydrothermal, hydrogenetic and diagenetic processes were attributed by different workers at various sites, during different studies. There are several observations made in this regard in recent years. From the geochemical and mineralogical studies on ferromanganese oxides from the CR area, Colley *et al.*[1] reported that hydrogenetic process is responsible for the ***d***-MnO_2 mineralogy and metal enrichment (e.g. Mn, Fe, Ni, Cu, Co) of those oxide deposits. The chemistry and mineralogy of ferromanganese nodules from another site of the CR (ref. 2) indicated some possible mixed hydrothermal–hydrogenetic input for the metal enrichment in those nodules. Shankar *et al.*[3] reported that the CR hydrothermal activity during Holocene epoch could be one of the possible sources for the geochemical variations observed in the surface sediment samples from several locations in the Arabian Sea. The idea of metal enrichment by hydrothermal process was contested by the study of rare earth element (REE) enrichment pattern (Ce/La and La/Yb) in the sediments from CR and adjacent Central Indian Ocean and a normal deep sea metal enrichment process in those sediments was suggested, ruling out the possibility of any hydrothermal contribution[4]. Further, from the occurrence of Pteropods in the sediments from the southern part of the CR, it was suggested that the Pteropod preservation at about 2000–2500 m water depth could have become possible due to an increase in alkalinity in seabed sediments, as a result of some hydrothermal inputs in that area[5].

The interlayer geochemistry of ferromanganese nodules from the southwestern CR (SWCR) and the specific mineral–chemical assemblages in those nodules indicated that hydrogenetic and diagenetic processes are responsible for their metal enrichment[6]. Further, study on geochemistry, factor analysis and clay mineral distribution of the sediments from the SWCR indicated their relationship with the associated Fe-Mn nodules[7]. *R*-mode factor analyses of the sediment and nodule geochemical parameters indicated different sources of trace metal supply, including biological, detrital, hydrothermal and authigenic processes. The presence of illite and chlorite in these sediments was linked to the Indus source, while an authigenic origin was proposed for the smectite and kaolinite, through the alteration of the ridge volcanic rocks[6]. Evidences recorded from further study on the geochemistry of calcareous sediments from the SWCR indicated the existence of a deeper lysocline (4700 m) and a deeper calcium carbonate compensation depth (CCD > 5100 m), in this part of the Arabian Sea[8]. It was also observed that the CR sediments are enriched in Mg, Ni, Co and Zn in comparison with the adjacent basinal sediments, while they are depleted mostly in all other elements. Also, the Ni and Zn enrichment in these sediments was linked directly to the biological processes (high surface biological productivity) active in this area[8]. The ferromanganese nodules and crusts (Mn/Fe < 1) with higher cobalt concentration (0.9–1%) and fresh basaltic and calcareous nuclei from the Vityaz fracture zone (at the south-eastern part of CR) are hydrogenetic[9].

REE distribution pattern in the surficial calcareous sediments from the SWCR area indicated that the total REE content in these sediments is inversely related to their calcium carbonate content and the REE show a strong positive correlation with Al + Fe + K + Mg + Na, suggesting the combined association of REE with clays and Fe-Mn oxides and also a hydrogenetic contribution of REE to these sediments[10].

From the above information on the geochemical sedimentation processes active in the CR and adjacent areas, it appears that hydrogenetic sedimentation process is most predominant among all other processes active in this region. Future research on sedimentary environment of the CR area should consider palaeoceanographic aspects of ridge sediments through long sediment cores, to understand the past geochemical processes and depositional conditions that prevailed in this area and their relevance to the present sedimentary processes, if any.

1. Colley, N. M., Cronan, D. S. and Moorby, S. A., in *La Genèse des Nodules*

de Manganèse (ed. Lalon, C.), CNRS, Paris, 1979, 289, pp. 13–21.
2. Karisiddaiah, S. M., *J. Geol. Soc. India*, 1985, **26**, 402–406.
3. Shankar, R., Subbarao, K. V. and Kolla, V., *Mar. Geol*., 1987, **76**, 253–279.
4. Kunzendorf, H., Stoffers, P. and Gwozdz, R., *Mar. Geol.*, 1988, **84**, 191–199.
5. Bhattacharjee, D., *GSI Mar. Wing Newslett.*, 1996, **12**, 10–11.
6. Valsangkar, A. B., Rajamanickam, G. V., Karisiddaiah, S. M. and Siddiquie, H. N., *Mar. Geol.*, 1988, **84**, 81–91.
7. Valsangkar, A. B., Karisiddaiah, S. M. and Ambre, N. V., *Mahasagar*, 1992, **25**, 83–95.
8. Valsangkar, A. B. and Ambre, N. V., *Indian J. Mar. Sci.*, 1995, **24**, 1–7.
9. Banerjee, R. and Miura, H., *Geo-Mar. Lett.*, 2001, **21**, 34–41.
10. Pattan, J. N. and Higgs, N. C., *Proc. Indian Acad. Sci.* (*Earth Planet. Sci.*), 1995, **104**, 569–578.

ACKNOWLEDGEMENTS. I express my sincere thanks to the Director, NIO, Goa for permission to publish this article. This is a contribution to the recent Indian initiative on mid-oceanic ridge research at NIO (InRidge project). Financial support was provided by USIF-ONR grant no. 0014-97-1-092 and CSIR, Govt. of India. This is NIO Contribution No. 3684.

RANADIP BANERJEE

Geological Oceanography Division,
National Institute of Oceanography,
Dona Paula, Goa 403 004, India,
e-mail: banerjee@csnio.ren.nic.in

NEWS

Curtain raiser to the forthcoming Third World Academy of Sciences' 8th General Conference in New Delhi

India is the venue for the forthcoming Third World Academy of Sciences' (TWAS) 8th General Conference and the 7th General Meeting of the Third World Network of Scientific Organizations (TWNSO). The meeting is scheduled to be held during 27–31 October 2001 in New Delhi. The TWAS has currently as President, Chintamani Nagesa Ramachandra Rao, who is a founding fellow of TWAS and a distinguished solid state chemist.

TWAS was founded in 1983 by a group of eminent scientists under the leadership of the late Nobel Laureate Abdus Salam. It was, however, officially launched in 1985 with its headquarters in the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy. In May 2001, its membership stood at 588 from 76 countries (62 of which belong to the developing world). Fellows are elected from amongst scientists who are citizens of developing countries and Associate Fellows, from citizens of industrialized countries who have originated from developing countries, else have distinguished themselves to the cause of Third World science.

TWAS in its mission of 'promoting scientific excellence and capacities in the South for science-led development' has since its inception, nurtured a high-level of scientific research tempo in the Third World. The TWAS has an agenda of five key activities. These are:

Capacity building for research: Grants of up to US$ 10,000 are given to young scientists from developing countries in the fields of biology, chemistry, mathematics and physics. Out of a total of 106 research grants awarded in the year 2000, the break-up by region is as follows: Africa/Arab nations: 23, Asia/Pacific: 41, Latin America/Caribbean: 42. In the period 1985–2000 out of 1434 research grants awarded, the region-wise distribution was as follows: Africa/Arab nations: 356, Asia/Pacific: 484, Latin America/Caribbean: 594. The overall distribution of research funding for all regions with respect to the different scientific fields is – biology: 666; chemistry: 240; mathematics: 108, and physics: 420.

TWAS, in its 'capacity building for research', also helps laboratories in developing countries augment their research efforts by purchasing spare-parts for scientific equipment, so as to help scientists perform experiments with minimal interruption. Since 1986, ICTP/TWAS Donation Programme has distributed books, journals, etc. from donors to institutions in developing countries. Through this programme, entire libraries and collections belonging to private or institutional donors have been shipped.

Fellowship and associateship: TWAS has the following schemes:

South–South fellowship: These fellowships help to promote mutual interaction between scientists in developing countries. Most of them are tenable for a period of 1–3 months, however, in the case of some countries in the Third World, visits up to one year are possible. In the period 1986–2000, region-wise break-up of fellowships awarded is: Africa/Arab nations: 122; Asia/Pacific: 212 and Latin America/Caribbean: 214.

Joint associate membership scheme: There are 88 centres of excellence from 21 Third World countries who participate in this scheme. Through this scheme, an associate appointed for three years can visit a centre twice for research collaboration.

Meetings and lectures

Support for international scientific meetings: Financial assistance is rendered for organizing meetings and conferences, related to topics of interest to the Third World. These meetings serve to promote regional and international cooperation for nurturing science in the developing countries. In the year 2000, a total of 43 such scientific meetings have been supported by TWAS. In the period 1986–2000, out of a total of 574 meetings assisted, 139 were in Africa/Arab nations region, 211 in the Asia/Pacific region and 224 in the Latin America/Caribbean region. Grants are offered in all areas of natural sciences, except physics and