

nology, which is far lower from that in most of the developed countries. In addition, many of the administrative and financial hurdles in the way of promising research scholars need to be got rid-off. Accessibility for talented students and teachers to good laboratories and rare equipments therein needs to be ensured. The culture of a collaborative and interdisciplinary approach, as commonly seen in European countries, is yet to take-off here. Comparatively poor theoretical background of the problems which they

pursue leaves our students handicapped in interpreting their results in a novel way.

Though it is the responsibility of the State to ensure basic facilities to science departments in terms of infrastructure and other services, it is the moral duty of the scientific community of the country to evaluate its approaches and designs of problems for reliability and reproducibility of the methodology, and applicability of the results and findings. Giving special appeal, incentives and inspiration to the younger generation, we need to moti-

vate them to take up science as the most rewarding career option.

1. Shukla, S. K., Singh, V., Shukla, P. K. and Srivastava, G. K., *Curr. Sci.*, 2007, **92**, 8.

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Thickness estimation of Deccan Flood Basalt of the Koyna area, Maharashtra (India) and implications for recurring seismic activity

Nayak *et al.*¹ attempted to give a reason for the recurrence of seismic activities around the Koyna area, Satara district, Maharashtra (India), while estimating the thickness of the Deccan Flood Basalt around the area through inversion of aeromagnetic and gravity data. However, they could not provide suitable explanation for many of the inferences and conclusions. For example, it is stated in the abstract and similarly in the conclusion that 'the entire column of lava below this region is made up of non-massive vesicular type of basalts having a low density of 2.58 g/cm³ and a porosity of about 17%'. Such statements are utterly misleading and contradict the information obtained so far on the Deccan Flood Basalt.

Auden² has determined a specific gravity of 2.88 g/cm³ for massive basalts in the area while looking for concrete aggregate for construction of the Koyna Dam. Srinivasan and Rama Rao³, while reporting the geological investigations for the Koyna hydroelectric project based on several test boreholes, have determined a specific gravity of 2.77–2.82 g/cm³ for massive basalts and 2.47–2.37 g/cm³ for vesicular (non-massive) basalts. A specific gravity of 2.76 g/cm³ inferred by Nayak *et al.*¹ at the basement of the 1500 m thick basaltic flow is even less than what was actually measured near the surface by the earlier workers^{2,3}. For the overlying basalts, Nayak *et al.*¹ infer a specific gravity of 2.58 g/cm³, which is much less than what is actually found in the field. Thus they are wrong in their whole exercise, and their interpretations are also unreliable.

The statement (p. 963) that 'calculated porosity of basalt is about 16.8%, which is close to the known average porosity of vesicular and amygdaloidal basalt', is untrue. There is no mention of the porosity of vesicular and amygdaloidal basalt in the report by the Central Ground Water Board⁴, based on which this statement has been made. This report⁴ gives an average value of 17% for basalts in general based on the work of McWhorter and Sunada⁵, who found a porosity range of 0.03 to 0.35 while analysing 94 samples of basalts. Deolankar⁶ determined a porosity of 50% for vesicular basalt. Porosity information provided by Nayak *et al.*¹ is vague without any proper reference and is completely misleading.

The entire thickness of the Deccan Flood Basalt consists of several basaltic flows, each consisting of two main trap units: (i) a lower massive unit and (ii) an upper vesicular/amygdaloidal unit. The massive unit constitutes the main trap unit and forms 60–85% of the flows. The vesicular/amygdaloidal unit forms the upper horizon of each basaltic flow and constitutes 15–40% of the flows. The density of vesicles increases toward the top of each flow. Generally, the consecutive lava flows are separated by a red layer, varying in thickness from 0.15 to 1 m, termed as 'redbole'. A field disposition of these layers is shown in Figure 1.

Thorat and Ravi Kumar⁷ have identified 27 basaltic flows in the exposed sections of the Koyna River basin with thickness varying between 10 and 60 m. What is observed on the surface is an indication

of what is expected below the surface. Therefore, below the Koyna Dam, several basaltic flows are expected to occur with alternating layers of non-massive vesicular basalt, slightly vesicular basalt and massive basalt (without vesicles), as already observed^{2,3,8–10} in the deep borehole logs of the Koyna Dam site. The borehole sections prove that below the Koyna Dam or even around it, the lava is not made up of non-massive vesicular type of basalt alone. Therefore, the



Figure 1. Disposition of basaltic flow layers and their contacts.

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statement by Nayak *et al.*¹ that 'the entire column of lava below the Koyna region is made up of non-massive vesicular type of basalts' is erroneous.

While proving their point for the non-vesicular nature of basalt below the Koyna region, Nayak *et al.*¹ cite examples of basaltic sections in Latur¹¹ and Bor Ghat¹². However, the authors should examine their observations based on the vast amount of geological information^{2,3,7-10,13,15} already available for the actual study area, rather than citing stray examples of studies carried out elsewhere by other workers.

1. Nayak, G. K., Agrawal, P. K., Rama Rao, C. and Pandey, O. P., *Curr. Sci.*, 2006, **91**, 960–965.
2. Auden, J. B., Report, Geological Survey of India, May 1951, p. 11.

3. Srinivasan, P. B. and Rama Rao, V., Report, Geological Survey of India, September 1959, p. 11.
4. Report, Central Ground Water Board, Government of India, Ministry of Irrigation, 1982, p. 183.
5. McWhorter, D. B. and Sunada, D. K., *Groundwater Hydrology and Hydraulics*, Water Resources Publications, Colorado, USA, 1977.
6. Deolankar, S. B., *Ground Water*, 1980, **18**, 434–438.
7. Thorat, P. K. and Ravi Kumar, M., Report, Geological Survey of India, 1987.
8. Auden, J. B., Report, Geological Survey of India, October 1952, p. 12.
9. Srinivasan, P. B., Report, Geological Survey of India, October 1954, p. 8.
10. Report, Geological Survey of India, 1974.
11. Reddy, G. K., Rao, V. G. and Rao, R. U. M., Abstr., Chapman Conference, American Geophysical Union, Hyderabad, 25–29 January 1998, p. 31.

12. Karmakar, B. M., *J. Geol. Soc. India*, 1978, **19**, 106–114.
13. Naik, P. K., Awasthi, A. K., Anand, A. V. S. S. and Mohan, P. C., *Hydrogeol. J.*, 2001, **9**, 243–264.
14. Naik, P. K., Awasthi, A. K. and Mohan, P. C., *Hydrogeol. J.*, 2002, **10**, 553–565.
15. Naik, P. K. and Awasthi, A. K., *Hydrogeol. J.*, 2003, **11**, 582–594.

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Sea-walls – A necessary evil

One can well understand the concern of Shareef¹ for the disappearing beaches in the wake of construction of sea-walls. Whereas fresh building activities have been banned under the Coastal Regulation Zone (CRZ) Act, what about the agglomerations that came up along the shoreline, centuries and millennia ago and are now affected by the advancing sea and the consequent nearing of the monsoon inundation line? Will it be practical and possible for the Government to evacuate and rehabilitate the millions living at the edge of the 7000 km long coastline affected by the landward march of the sea? The 'no encroachment' area proposed by Shareef is a good solution, but too late to be implemented for a densely populated country with a long history.

Vertical walls like the one at Marine Drive, Mumbai, supported by tetrapods, or at Puducherry promenade supported by boulders provide good protection, but are expensive. The disadvantage is that the sandy beach is lost as the waves come right up to the wall. These walls need periodic repair as tetrapods and boulders sink in the sand. The cost of repairs to the Marine Drive wall is reported to be Rs 18 crores for a length of 600 m.

Engineers at the Central Water and Power Research Station, Pune, have come out with a design of onshore breakwaters, which in a sense are boulder-walls, for Tithal and Udvada beaches, Valsad district, Gujarat, that are severely affected by sea-erosion. A village in Valsad district, Moti Dandi, has already been washed away by giant monsoon tides. Seven such breakwaters covering a length of 600 m have been constructed on Udvada beach in 1998–99 at a cost of Rs 55 lakhs. This may be compared with the colossal cost of repairs to the Marine Drive wall. The breakwaters now protect the properties at the sea-front.

So far the problem has occurred only during the peak of monsoon: During a storm, atmospheric pressure falls and the sea level rises. Coupled with the high tides of the new moon or full moon days giant waves ravage the shoreline. The northern ends of the breakwaters break down after 3 to 4 years of violent storms and tidal onslaughts. However, any structure that controls such a mighty force needs periodic repairs. Meanwhile, sand keeps on accumulating on the landward side of the walls. Thus the walls 'sacrifice' themselves to protect the town.

An alternative to breakwaters (sea-walls) is the beach nourishment treatment that was proposed for Udvada in order to eliminate the sea-walls. The idea was to dredge the nearby Kolak River and deposit the sand on Udvada beach. Social and ecological problems cropped up in the way of the project. Residents of Kolak village opposed the plan on CRZ grounds. Secondly, the Kolak creek is lined by mangroves, which stabilize its banks. But these salt-water trees are known to react to dredging operations, which alter the ecological conditions of the creek. And with the disappearance of the mangroves, stability of the banks cannot be assured.

Vegetation which is effective in curbing wind-erosion, unfortunately gets uprooted by the force of waves, unless present in protected pockets like mangrove marshes.

1. Shareef, N. M., *Curr. Sci.*, 2007, **92**, 157–158.

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