Lack of motivated students in science

The lack of young and talented students in science has often been bemoaned in this column and recent editorials (*Curr. Sci.*, 2002, **82**, 241–242; 903). It is paradoxical that on one hand, good students are unavailable for filling research and faculty positions in basic and applied sciences, while on the other, a large number of science graduates and post-graduates languish among the ranks of unemployed. The various schemes like national science talent search scholarships, etc. unfortunately may have an inherent shortcoming. The highly competitive nature and process that these selections entail, ensure that only the most 'academically' brilliant students make it through. Unfortunately, science as a career offers poor rewards for those talented people, whom the greener pastures of engineering, medicine, bureaucracy or business claim at the first opportunity.

But how far do these various schemes and selection procedures attract or select young, competent people who love doing science and research, but are less gifted than their more brilliant peers? Is academic brilliance, often the result of superior memorization capability, to be the main or only yardstick for selection? Do originality in thought, innovative ability and passion for hands-on science despite meagre rewards, count for naught? The selection processes may perhaps be discounting these very qualities, which many gifted scientists of this century possessed, while not exactly being stars of the academia. Science and research should no doubt ensure a decent standard of living for its practitioners, but in the final analysis are better done by those for whom it is a passion, not just a profession.

M. R. RAGHUNATH

Peninsular Aquaculture Division of Central Institute of Freshwater Aquaculture,
Hessarghatta Lake PO,
Bangalore 560 089, India
e-mail: raghumr@vsnl.in

Research non-guides

Research is a delicate intellectual activity which requires a sensitive human interaction between the scholar and the guide. A thorough understanding between the two individuals, one aspiring to do something creative and another inspiring the activity, is needed. But nobility has become a rare virtue in our milieu. Irresponsibility, jealousy, arrogance and even cold-villainy have become common traits of persons even in the institutes of learning and research. It is human to err. Unless the guide takes it lightly, even a small mistake of the research student shall be deemed unpardonable. Any slight displeasure that crops up due to social, cultural or academic reasons, between the guide and the research student is surely to the disadvantage of the latter. In an atmosphere where research guides (more so in universities) are influenced by extraneous feelings like caste, community and group, the student is a helpless partner at the mercy of the teacher-guide. Very few guidelines exist to correct the situation, to do justice and to save the young soul when the mutual relation goes astray. Higher academic authorities feel embarrassed to come openly to protect the weak and help the guide to guide the student with a human face. The student also can err and misbehave, but the system has a structure to punish the guilty very easily. The problem becomes confounded if either of the two belongs to the opposite sex. The percentage fall-out of students from research is around fifty in universities (slightly less in research institutes), which is more often than not due to hostile treatment meted out to the young scientists. As the cynical attitude in supervisors cannot be eroded by a simple rule or regulation, the issue has to be discussed at higher fora of scientific administration of the country to develop a self-corrective mechanism, ensuring smooth research activity with a human face.

CHANDU SUBBA RAO

Department of Geophysics,
Andhra University,
Visakhapatnam 530 003, India
e-mail: ahivisakha@hotmail.com

Hazardous waste dumping in India by developed countries should be discouraged

Vast amounts of hazardous electronic, plastic and scrap metal waste materials have been burned or discarded in the fields, irrigation canals and waterways across developing countries in Asia, polluting the natural environment. According to a report by the Seattle-based Basel Action Network, millions of kilograms of electronic waste from obsolete com-

puters and televisions are being generated in developed countries each year, of which an estimated 50–80% is being shipped for recycling in countries such as India, China and Pakistan.

Cheap manpower, inadequate environmental standards and lack of enforcement of environmental laws in developing countries attract 'high-tech garbage dumping' in the name of 'recycling', exposing the poor to face poison and slow death. The Toxics Link India, a local NGO recently found thriving electronic waste trade in places such as Mandoli, Sadar Bazar, Kanti Nagar Extension, Old Sealampur and Turkmangate in Delhi, where men, women and children break and process obsolete computers imported from overseas without knowing their deleterious effects. They also burn plastics and metals releasing toxic ingredients such as lead, beryllium, mercury, cadmium and brominated-flame retardants that pose occupational and environmental health hazards.

Recently, a private company in Chennai called Sabari Exim has imported about 30,000 tonnes of scrap from the destroyed World Trade Center in New York. The environmental watchdog Green Peace rang the alarm bell stating that the historic garbage might be contaminated with cancer-causing asbestos, polychlorinated biphenyls (PCBs), dioxins, furans, mercury, lead and other heavy metals. The US government did not give any evidence that the scrap sent to India was free of toxic contaminants. Although steel scrap is a legal trade in India, the conditions under which the rubble was created during the 11 September crisis raise concern about noxious contamination. The workers in Chennai unfortunately cannot afford to wear expensive full-body protection and gas masks to handle the waste. Despite the fact that the Supreme Court of India has imposed a blanket ban on all import and export of hazardous waste in 1997, the ban is apparently being violated occasionally.

Plastic is one of the most unsustainable products as it is non-biodegradable; and cities, towns and rural areas are facing a crisis with plastic waste that is produced within India and imported from abroad. According to data from the Government of India, about 59,000 and 61,000 tons of plastic wastes were imported in 1999 and 2000 respectively[1]. The imports included wastes of highly toxic poly vinyl chloride (PVC) from USA, the Netherlands, France, the UK, Belgium, Japan and Taiwan.

In February 2002, the Danish Minister of Environment, Hans C. Schmidt was profusely apologetic to the fact that his country had been sending plastic waste to India for recycling, illegally. 'This would be the last time something like this has happened', he said during the Delhi Sustainable Development Seminar organized by Tata Energy Research Institute. Denmark is known for its commitment to environmental causes and thanks to a local NGO, No Plastics in the Environment, which brought the fact to light by informing the Danish Mission in New Delhi to apprise the minister of the illegal waste-dumping saga. There is no doubt that the health risks, including cancer are high for those who handle toxic wastes as well as for those who live near the processing and burning sites. Recent studies in the UK indicate that the risk of leukaemia and liver cancer are significantly high among children and adults who live near municipal incinerators; primarily due to the spread of carcinogenic combustion effluents[2,3].

Taiwan is a tiny island nation with a land area similar to that of the south Indian state of Kerala. It has transformed itself from an agricultural backwater status to that of a global technological giant over the last few decades, often leading to environmental disasters[4]. Export-based plastic and electronic industries form the backbone of its economy, generating billions of dollars. As a result, thousands of tons of toxic wastes are produced that cannot be safely disposed in the already over-crowded island (616 people/km^2). Thus Taiwan sporadically seeks cash-starving countries in the developing world that will dispose of the wastes for a hefty fee. In 1999, Cambodia returned 2700 tons of mercury-laced waste after intense public outcry and several deaths that occurred near the disposal site[4]. Moreover, the economic super-power, USA, has large land area but it attempts to keep its environment clean by shipping toxic wastes elsewhere; officials with the Environmental Protection Agency have acknowledged that a large portion of the nation's electronics waste is being exported. Instead of banning such practices of exporting wastes to developing countries, the developed nations are obviously encouraging this horrid trade and avoiding ways to find solutions for the safe disposal of accumulated hazardous wastes in their own backyards. It is time for government agencies, NGOs and the scientific community that are concerned about India's natural environment to be vigilant; they should not hesitate to take appropriate actions against dumping of technological waste by wealthy nations.

1. Statistics of Foreign Trade of India, Government of India, 2001.
2. Knox, E. G., *Int. J. Epidemiol.*, 2000, **29**, 391–397.
3. Elliott, P., Eaton, N., Shaddick, G. and Carter, R., *Br. J. Cancer*, 2000, **82**, 1103–1106.
4. Agoramoorthy, G. and Hsu, M. J., *Nature*, 2000, **408**, 905.

GOVINDASAMY AGORAMOORTHY*
MINNA J. HSU

Department of Biological Sciences,
National Sun Yat-sen University,
P. O. Box 59-157,
Kaohsiung 80424, Taiwan
**For correspondence.*
e-mail: agoram@mail.nsysu.edu.tw