reality in a large scale all over the country.

It appears that the realization that computational chemistry is important to experimental chemists is yet to be taken note of. An examination of the research articles from the best experimental groups around the world shows that a good number of them also discuss their results along with theoretical calculations. The reluctance of using computational methods to help experimental studies reminds one of the disdain expressed by many chemists when NMR came as an operational machine. Solving a molecular structure by IR and NMR was termed as 'cheating' by some classical chemists. But soon they adopted NMR machines as an unavoidable part of a chemical laboratory. Similarly, many outstanding chemists abroad have adopted computational methods as unavoidable tools. It is perhaps just beginning here. There are many other reasons to use computational and theoretical methods to do chemistry which are not elaborated here.

I do not regard chemistry as mundane. We concede much as physics and biology. Instead of blaming theoretical chemistry, physics, or biology, chemists should be bringing out dramatically the molecular origin of everything, including life and death, biomaterials and nanoscience and everything else that has slipped away from chemists, but is chemistry.

E. D. JEMMIS

School of Chemistry,
University of Hyderabad,
Hyderabad 500 046, India
e-mail: jemmis@uohyd.ernet.in

Milestones in schizophrenia research

How are abnormalities in disparate brain regions related to each other in order to contribute to the clinical phenomenon of schizophrenia? This question asked by Rao (*Curr. Sci.*, 2002, **83**, 1183), is a million-dollar question, which if answered, will bring a ray of hope to all the patients worldwide. Though cell bodies in the brain stem and midbrain (tegmentum) that project widely to the cerebral cortex and forebrain limbic system (entorhinal cortex), are thought to be involved in schizophrenia (*The Brain: A Neuroscience Primer*, second edition, p. 133), a clear-cut functional and structural involvement still needs to be elucidated. The brain bank facility started at NIMHANS, Bangalore, jointly funded by DST, DBT, ICMR and NIMHANS, is a big leap in this direction (Sen, Nirupa, *Curr. Sci.*, 2002, **83**, 544–545). Due to genetic and phenotypic heterogeneity underlying this disease, the genotypic studies have been inconsistent. But schizophrenic and control brain samples can be effectively utilized to study the gene expression and finally to aim at all the culprit genes in the Indian population. One such study, carried out by Mental Health Research Institute, Australia, has already identified 153 genes affected by schizophrenia.

What we require today, is a complete understanding of the pathogenicity of schizophrenia. The brain bank facility is definitely going to come in handy for this purpose.

VIBHUTI SRIVASTAVA

Department of Genetics,
University of Delhi South Campus,
Benito Juarez Road,
New Delhi 110 021, India
e-mail: vibs1979@yahoo.com

Botany students must help in the conservation of plants

Shekhar Banerjee's appeal to botanists to 'think'[1] is a necessary reminder. Way back in 1991, I had expressed my views against the need to collect 'important' plant species by each botany student, for submission of a herbarium[2], citing examples of *Isoetes*, *Osmunda*, *Ophioglossum*, pitchers, etc. that were vanishing from their natural habitats. Some statistics was also attempted to show that literally lakhs of flowering twigs were destroyed by graduate and postgraduate students of botany all over the country, every year, for the exercise of preservation of plants which should be actually conserved by them. Some university teachers wrote to me that they had confined herbarium activity to only weedy species, while some discouraged students by giving negative marks for herbaria containing 'rare' species. Banerjee's letter however, shows that the academic situation has hardly changed since the eighties of the last century, and that there is little concern for the rapid disintegration of natural biota.

To a great extent, I would blame our teaching fraternity who (a) are generally indifferent to the seriousness of the problem of vanishing species, (b) follow out-dated methods of evaluation of students' performance, and (c) are not careful about informing students (due to ignorance/lethargy) about the importance of every small step in the major effort of conservation. Such an attitude permits field tours to degenerate into 'collection cum sight-seeing picnics'.

I am directly and indirectly associated with some environmental education programmes conducted for school children and general public in which students and teachers of university also participate. The Department of Extra-Mural Studies of the University, Bombay Natural History Society, World-Wide Fund for Nature, etc. are at the forefront in organizing these weekend studies of nature, enlisting services of well-informed and trained volunteers from the society. These programmes are received extremely well and prove beneficial to student participants and laypersons, as also for conservation of the interesting habitats that they visit.

On the basis of the above experience, I would like to suggest the following strategy aimed at educating students and teachers from schools and colleges and encourage them to inculcate the ethics of conservation in the society at large. This will benefit botanists of today and tomorrow, and also lead to conservation of species and their habitats.

(a) Botanical excursions should be called as field exercises and *not* collection tours.

(b) These should be conducted by teachers/guides who have undergone training/orientation in field studies and are conversant with the rigorous ethics of conservation.

(c) Universities should conduct such orientation courses for teachers under the auspices of UGC.

(d) Along with taxonomy, conservation bias should also be indoctrinated.

(e) 'Collection' of plants from fields should be prohibited and students indulging in plant collection should receive negative credit.

(f) Herbarium techniques should be taught to students using only abundantly available, cultivated or weedy plant species.

(g) Maintenance of field diaries should go beyond lists of plants spotted and should give due weightage to description of plants, their habitat and ecological status in the local plant community.

(h) Field studies should be conducted more frequently, students should consider them as 'a way of life' during their learning process, rather than an occasion for a picnic.

(i) A sense of 'compulsion' to attend field studies should be removed by making them optional or for volunteers only. Nature, requiring protection, has no place for reluctant visitors. At the same time, incentives for good field work may be considered.

(j) And last and very important, 'professional plant collectors' should be discouraged by patronizing only nurseries and research stations that maintain and regenerate plants for study.

1. Banerjee, S., *Curr. Sci.*, 2002, **83**, 1060.
2. Chaphekar, S. B., *ibid*, 1991, **60**, 624–625.

S. B. CHAPHEKAR

14, Dhus Wadi, Thakurdwar,
Mumbai 400 002, India

Delhi iron pillar and its relevance to modern technology

Often, the relevance of studies conducted on ancient Indian science and technology is questioned because no direct applications can apparently be envisaged by the revival of ancient Indian technologies in the modern context. However, studies on ancient Indian science can open new lines of thinking which may prove beneficial, if applied appropriately, in modern times. In this letter, we present a new idea for the possible application of the scientific and technical knowledge that we have accumulated on the historically, culturally and scientifically significant Delhi iron pillar[1].

We begin by noting certain basic facts about modern iron and steel-making technology. The technologies dealing with both the extraction of metal from the ore in the blast furnace and its conversion to steel, are highly environmentally unfriendly. The emission of greenhouse gases and their role in causing deleterious climatic changes have been well documented. Therefore, there is an urgent need to adopt iron-making technologies that do not emit significant amount of greenhouse gases. The main culprit is, of course, coking coal used for extraction of iron. Interestingly, all the major coke oven batteries in existing iron and steel plants around the world are due for significant replacement in the very near future. The huge investment required for this activity has provided an opportunity to look afresh at the entire iron and steel making operations, in general. In this regard, the direct reduction process of iron making, which was in vogue in ancient India, may be relevant to solve the environmental pollution problem, especially if a clean reductant like hydrogen can be used for the reduction of the ore to metal. The iron produced from the direct reduction processes can be utilized for several large-scale applications. One important application is the production of corrosion-resistant iron. The specific environment in which corrosion resistance needs to be enhanced is atmospheric exposure. Huge investments are being currently made to prevent and control the atmospheric corrosion of iron objects. The Delhi iron pillar reveals that phosphoric irons would offer excellent resistance to atmospheric corrosion[2]. Therefore, production of phosphorus-rich iron from the output of direct reduction furnaces would be a major step that needs to be debated. In this regard, the relevance of puddling technology must be emphasized. In the puddling process, the interstitials (carbon, phosphorus, etc.) are reduced by reacting with iron oxides in the puddling furnace and the operation is carried out in solid state. The puddling process of manufacturing wrought iron, which has almost died, could be revived so that phosphoric iron can be produced in large quantities. Additionally, the slag composition can be controlled to allow higher P retention in iron. This can be easily achieved by minimizing limestone charge in the puddling furnace. This would also reduce the environmental pollution problems associated with limestone mining. The end product of the pudding furnace is phosphoric iron, which would be corrosion resistant in atmospheric exposure conditions. Moreover, the entrapped slag inclusions