

In this issue

Looking at the Universe

From the abode of the gods

About fifty kilometres from Nainital in the Himalayas, about two and half kilometres above sea level, there is a place called Devasthal, the abode of the gods. The Aryabhata Research Institute of Observational Sciences has an observatory there to look into the universe. About three years ago, a new optical telescope, the largest in India, was set up at the observatory.

A primary mirror of 3.6 m collects even scant light, reflects it off to a much smaller secondary mirror from where it is directed to various detectors. One such is an optical spectrograph and camera arrangement that records very faint celestial objects. A collimator and a focal-reducer unit give non-dispersed images. Optical filters and dispersive elements – prism, grism or gratings – can be deftly inserted into the path of light by a computer controlled mechanism to generate data for analysis and to gain deeper perspectives.

The spectrograph and camera arrangement looks at the universe through a very narrow slit and sees objects so remote, that for the human eye to see them, they have to be amplified ten million times.

In a General Article in this issue, researchers from the Aryabhata Research Institute of Observational Sciences provide us glimpses into the agonies and ecstasies of designing, assembling, constructing and operationalising the tools that provide us a new vision of the faint objects far away. Flip to **page 1472** for more.

Plant Lectin Structures

Recognising sugars

G. N. Ramachandran, doyen of biophysics, initiated biological macromolecular crystallography at the Molecular Biophysics Unit in IISc, Bengaluru. In the latter half of the twentieth century, this gave rise to a core group of structural biologists in Bengaluru. From the 1980's, a small sub-group attacked the problem of the structure of plant lectins. These carbo-

hydrate binding proteins recognize different sugar structures and are essential components of signalling processes in plant cells.

A Review Article on **page 1490** in this issue gives us a historical perspective on the growth of the field. Though India lagged behind the developed countries in adopting synchrotron facilities and position-sensitive detectors, though at a historical juncture, much needed computational facilities were not easy to procure, the expertise in the field flourished and moved into other cities in India to grow into a network.

Starting with a lectin from the castor plant to lectin from peanut, to that of jackfruit and the winged bean, the insights on plant lectins born out of the studies by the Bengaluru group are significant. The review gives us the different kinds of folds in the lectins, and the manner in which they come together to form dimers, tetramers and oligomers to recognise sugars of different kinds.

Now we know that lectins exist in all domains of life. The work continues...

Wind Energy Farms

Bird deaths count

Wind farms provide renewable energy for energy hungry populations. But they are noisy. So keep them far away from human habitats. Of course, it disturbs local fauna too. So you can't have them in National Parks, for instance. But how about avian fauna? Those that fly kilometres and migrate seasonally to cross the path of turbine blades?

Researchers from the Sálim Ali Centre for Ornithology and Natural History, Coimbatore and the Bombay Natural History Society, Mumbai examined two wind power generation sites. The one in the Kutch district, Gujarat had about 200 turbines spread over 120 sq km. One hundred and seventy four species of birds are found there, including those migrating through the Central Asian Flyway. The other, in the Davangere district, Karnataka, had 24 wind turbines in 56 sq. km

and had 115 species of birds reported from the area.

The researchers traced spiral paths under many selected turbines, searching for bird carcasses. In the first site, the carcasses could be found as far away as 80 m from the turbines. But most were found within 20 m. Most bird mortalities happened during the migrating season. The carcasses of 11 species of birds could be identified, with some listed as vulnerable. The second site, in Karnataka, had a lower number of species.

Such observations can lead to underestimation because of scavengers that carry away the dead/wounded birds. The researchers used methods to reduce the effect of this confounding variable. Read more in the Research Communication on **page 1587** in this issue.

Fluorides and Fluorosis

Food and water

Fluorides in small concentrations in drinking water help prevent dental caries. But beyond 1.5 parts per million of fluoride in water puts you at risk of dental fluorosis. Chronic exposure to high doses leads to skeletal fluorosis, and physical and mental crippling.

While evaluating fluoride concentrations in drinking water in a fluoride endemic area, researchers from the Visva-Bharati, Santiniketan came across a curious phenomenon.

They found that the urinary concentrations of fluorides did not differ much between villages though the fluoride concentrations in water were quite varied. High fluoride exposure but relatively less excretion on the one hand, low fluoride exposure but high urinary concentration on the other! The expectations about correlations between fluoride concentrations in water and dental fluorosis were also broken.

The Research Communication by the team comes to the conclusion that it is not only drinking water – fluoride intake through food also contributes to the development of fluorosis. Turn to **page 1551** in this issue.

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