In this issue

Clearing the Air

Origins of dust in Martian atmosphere

MAVEN, a space probe developed by NASA, showed that the atmosphere 150–1000 km from the surface of Mars contains dust. The source of this atmospheric contamination, however, remains elusive. There are three possible explanations. The contaminants could be particles from the Martian surface that levitated due to dust vortices. Or they may be dust grains from Phobos and Demios, the natural satellites of Mars. They could also be remnants of interplanetary micrometeorites that frequently enter the Martian atmosphere.

Vortices cannot explain the dust at more than a 100 km, as is found on Mars. And if it is from the moon or from interplanetary space, the dust should, theoretically, assume a ring and start orbiting the planet. But no such dust rings have been spotted.

To fill this lacuna in our understanding of Martian dust, scientists are planning sophisticated instruments for the next Mars mission. For details, read the General Article on **page 2080**.

Testing the Mettle

Ciliated protists in ecotoxicology

Wastewater discharged from factories and industries often contain large amounts of heavy metals. These elements tend to interfere with pathways essential to life and cause toxicity. Hence there is a need to monitor their levels in freshwater, especially those that are sources of drinking water.

A team of researchers from the Delhi University, and the Natural Museum of History, London present a rapid, inexpensive and simple method to assess the toxicity: ciliated protists.

Ciliated protists behave more like human cells than bacteria or fungi. They multiply rapidly and are easy to study. The scientists collected these organisms from three areas in Delhi and cultured them in increasing concentrations of five heavy metals: zinc, copper, nickel, lead and cadmium. All of them showed similar trends for toxicity – highest for copper and least for zinc.

The Research Article on **page 2141** in this issue highlights the potential of using these organisms for ecotoxicological assessments of freshwater bodies.

Coastal Needs

What self-help groups require

India lags far behind in the number of women entrepreneurs. Even though many women begin small business units, few are able to carry on and develop their enterprise. To take loans from money lenders is not a feasible option in rural areas. To address these problems, women from villages are organized into self-help groups.

On **page 2183** in this issue, a Research Communication from the ICAR-Central Institute for Women in Agriculture explores the problems faced by such organizations. Based on a survey of 240 women across 24 self-help groups in 4 villages in the coastal areas of Kerala, the author tries to identify potentially rewarding entrepreneurial alternatives to fishing.

Based on the resources available to most women, aqua tourism, fish drying units, value addition to fish products and catering are identified as lucrative activities for the self-help groups in the area. The data highlights that many women are unaware of available technologies and lack the technical skill for improving their livelihood.

Such research can focus the attention of the NGOs and the Ministry of Skill Development and Entrepreneurship on the action required.

Building Bridges, Not Walls

And other metaphors

Numbers, equations and statistics often overwhelm students and distract them from understanding mathematical concepts. It is therefore extremely important to visualize the principles of Mathematics from every angle possible. Now, researchers from the Institute of Teacher Training and Education, Indonesia explore the role of metaphors in fostering mathematical understanding.

In a Research Communication on **page 2160** in this issue, they argue that even though a single metaphor may be insufficient to capture the essence of a mathematical concept, a creative teacher can use a series of metaphors to bring home the idea. Because metaphors share both similarities and differences with the concept being discussed, they give a creative dimension to learning. They evoke feelings which foster higher cognitive learning.

Learning Styles

Predicting from correlations

Taking courses over the internet is becoming increasingly common. Many Ivy League universities now offer certificate courses through e-learning platforms. Even though a lot of planning goes into structuring the lessons for a broad audience, the learning models do not always have a way of catering to the different learning styles of students.

Every learner has a set of biases that originate as a result of geography, environment, upbringing, schooling and geopolitics and therefore, may have different learning curves. What we need then, is a programme that can adapt automatically to the learning behaviour of each student. But this requires understanding the students' learning behaviour. The traditional questionnaire-based method for assessing student learning has largely been unsuccessful in mapping the different behaviour patterns.

Now a team of researchers from the University of Malaya, Malaysia have developed a mathematical model for predicting the learning styles from learning behaviour. They tracked the responses of 33 students in an e-learning module. The data was measured using the Index of Learning Style. They used correlation analysis on the data of 30 students, to determine the relationship between learning behaviour and learning pattern. And then they used the model to detect the learning styles of the remaining three students. A Research Article on **page 2090** in this issue provides the technique to detect learning styles.

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