In this issue

The Case of Science Education
Mind the gap

Science is more of a process rather than a collection of facts. But that's not how it is treated in schools. Over the years, text books have been stuffed with knowledge but less time is being devoted to understanding how that knowledge was created in the first place. Observation and analysis, necessary for developing scientific temper, are not given their due in Indian education.

This should be a matter of concern since the Indian Constitution states that we have a duty to develop and enable scientific outlook in society. Though it is encouraging to note that, even early on, nation builders recognised the importance of science education in instilling rationality among the masses, the changes in education policy have hardly lived up to this goal.

In a General Article on **page 1825** Ramjit Kumar and Smriti Singh trace the history of science education in India. They highlight the time points when it underwent dramatic changes and how it affected the culture of science education in India.

The Newtonian Order
How combating guinea led to fluorosis

After smallpox, India has been successful in eradicating Dracunculiasis – guinea-worm disease. This disease is caused by a parasite found in stagnant water. Before 1983, when the guinea worm eradication programme was launched, most traditional water sources in Rajasthan consisted of open-wells and stepwells that stored water for long intervals. But such sources usually became infected with water fleas carrying guinea-worm larva. People drinking this contaminated water became infected with the disease.

To combat this, the government started providing hand pumps and bore wells even in remote areas and covered all stepwells. While it was successful in preventing guinea-worm infection, sourcing water from greater depths came with its own problems. Rajasthan is rich in fluorides and groundwater from this region contains levels of fluoride that are greater than the acceptable limit of 1.0–1.5 ppm. This has led to the problem of hyperfluorosis in a large part of the Rajasthani population.

On **page 1851** Shanti Lal Choubisa presents the situation as is in a review article. He also focuses on the eco-geography of the region and how it has led to altered intensities of fluorosis across Rajasthan.

Assessing Nano Carbon
Small and powerful?

In their native form, nanocarbon materials are insoluble in water. This was the biggest limitation to their use. But, now, scientists have found a way around the problem. Nanocarbon materials can be optimised by digesting them mildly with alkali. Doing so frees certain carbon groups to form carboxylic acids. This improves water solubility and provides sites for attaching other functional groups.

As a result, these functionalised soluble nanocarbon materials are now being tested for diverse applications – sensors, diagnostic tools and even for delivering drugs within the body. Because of their chemical inertness, they are assumed to be safe. But is that true? S. V. Eswaran reviews the existing literature and presents some compelling information. He also elucidates the research gaps that must be explored before water soluble nanocarbon materials are deployed for use in humans. Read the Review Article on **page 1846**.

Antimicrobial Resistance
Actions and attitudes supporting it

In 2009, a Swedish national became infected with a resistant type of bacterium responsible for causing pneumonia. Doctors thought that he may have picked up the bacteria while on a trip to India. As a result, when the gene responsible for drug resistance was isolated, it was named New Delhi metallo-beta-lactamase.

While this created a lot of controversy, it also exposed the lackadaisical attitude of Indians (both clinicians and patients) towards antibiotics. Due to overuse, bacteria have started becoming immune to antibiotics. If this continues, even common diseases such as typhoid and cholera can become life threatening.

In a Research Article in this issue, scientists from the CSIR-National Chemical Laboratory, Pune discuss the attitudes and practices of people living in urban India that contributes to this menace. They surveyed around 500 people in Maharashtra. Only 4 had the correct knowledge, attitude and practices related to the use of antimicrobials.

Head over to **page 1866** to find out whether you are guilty or not, and what you should be doing.

Changing Oxygen Minimum Zone
Monsoon and geochemistry

The marine subsurface zone formed due to the decomposition of organic matter has reduced oxygen content and is highly inhospitable for higher organisms. Recently the oxygen concentration of this zone has shown changes. But there is no clear indication of the cause.

One factor could be the biological processes occurring on the surface. These are dependent on sunlight and nutrients and could influence the levels of oxygenation in this layer. Many peninsular rivers carry terrigenous materials that they unload in the Bay of Bengal and could have caused nutrient enrichment. However, the quantity of mineral discharge depends on the intensity of monsoons and there seems to be a lacuna of information regarding the effect of the Indian summer monsoon on the oxygen minimum zone in the Bay of Bengal.

Now scientists from Goa have evaluated the sediment chemistry of this region and compared it with the intensity of the monsoon in the area. They looked at the time series of oxygen isotopes and elemental composition of the sediment, including redox-sensitive minerals like manganese and cobalt and how it changed with monsoon in the zone over the last 42,000 years. To see what they found, turn to the Research Communication on **page 1940**.

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