

## In this issue

### Buoys: from tsunami to cyclones

The 2004 tsunami woke the world up to the need for early warning systems for giant waves. Soon there were different kinds of buoys in the oceans that could measure the roll and pitch of waves, its height and direction. Such buoys in the oceans nearby relay continual information to INSAT system of satellites and from there to Information Services and Ocean Sciences Group in Hyderabad. Within 10 years, the information flow from this network of buoys has proved to be useful in generating dependable early warning systems for not only tsunami waves but also those generated during cyclones in the east coast of India.

The research communication on **page 1121** of this issue examines the accuracy of wave forecast issued on 11 October 2013 by comparing it against those measured during the cyclone *Phailin* that stuck Gopalpur in Orissa on 12 October. The waves had reached a height of more than 13 m during the cyclone. The comparison of the three hourly forecasts with the data measured later at the landfall of the cyclone demonstrates the relevance of these national level technological investments for the safety of coastal communities, fishermen, shipping and other marine activities.

Besides its use in disaster preparedness, the data from the buoys is a mine for scientists trying to dig up nuggets of understanding of the behaviour of oceans and its relationship with atmosphere. The data will provide both a platform for inspiration for new theories and a testing ground for hypotheses in earth sciences.

### Antimony of antimony

Antimony is a soft grey metal. As a metal, it is toxic – slightly slower than arsenic in its action. But the sulphide of the metal has been used as beauty enhancing eye liners for the last few thousand years. And today it is found in various forms in lead batteries, bullets, bearings, pump seals, etc.

Bearings and pump seals containing graphite impregnated with antimony are used in the coolant systems in Pressurized Heavy Water Reactors. These reach high temperatures and pressures to release nanoparticles of antimony. The

nanoparticles deposit on the surfaces in the core of nuclear reactors. Neutrons in the core convert the antimony in the nanoparticles to its radioactive forms. Some of these radioactive atoms of antimony are released and get deposited on the surface outside the core as well as on the surfaces of the tubes in steam generator. When the reactor is shut down for maintenance operations and the steam is drained, the radioactive antimony is released. Not beauty enhancing eyeliners this. Not even just the toxic metal. But high man-rem exposure of radiation for the maintenance personnel.

So scientists from Bhabha Atomic Research Centre get back to the basics in a research article in this issue. They examine the process of antimony deposition in the core of nuclear reactors to seek ways for reducing it. They also examine the methods to decontaminate the heat transport system to find solutions to the problem of exposure of the personnel to radioactivity. Once again, scientists are on the path to find simple solutions to complex problems. See **page 1094**.

### Mom! there's something in my milk

Bisphenol A is a plasticizer. Domestic kitchenware, including baby-feed bottles, is known to contain Bisphenol A, or BPA for short. In the last decade, many studies have established BPA as an endocrine disruptor. Meiotic abnormalities, obesity, cancer – are only some of the ill effects observed in animals when they ingest BPA.

In a general article on **page 1081** of this issue, researchers from Tiruchirappalli, India, report the leaching properties of BPA from the plastic of three commonly used brands of baby-feed bottles. The study reveals that the bottles, on an average, leach around 19 ng of BPA/ml when kept at 70°C for one hour. In other words, a 4.5 kg infant would, along with its milk, suckle 2.9 µg of BPA/day/kg. The amount of BPA leached was observed to be less than the recommended tolerable daily intake of 5 µg/day/kg. However, the notion that low levels of BPA ingested would not be deleterious to one's health is a red herring. Other research studies have shown that individuals, particularly children, are vulnerable

to the ill effects of BPA, even at low concentrations. Today, serum samples from human populations worldwide already show nanomolar concentrations of BPA. Therefore further studies are needed to account for factors that could contribute to the leaching of BPA such as: the age of the plastic, the pH and temperature of the food.

Countries such as Canada, Denmark and France have banned the usage of BPA in feeding bottles. India, however, still allows BPA in baby-feed bottles without even a label indicating its concentration.

### The winged swirl of mahogany

There is a peaceful turbulence in the swirl of a mahogany seed as it descends. Autorotation – continuous rotation of the seed sustained solely by aerodynamic forces – is useful in taking the seed far away from its parent tree. In this issue, researchers from Bangalore, India, model the autorotative descent of the mahogany seed.

The study highlights the flaws associated with the overly simplistic momentum theory. An experimental set up, which used a high speed camera to observe the trajectory of 13 different seeds, provided real time data. Contrary to what the established momentum theory predicts, it was observed that during its descent, the seed exhibits not only the windmill state but also the turbulent windmill state. Further, the study also developed a computational model to predict the autorotative dynamics of the mahogany seed. The model may provide insights into the designing of superior turbines and windmills. Although the results between the experimental and the computational data are encouraging, this research article itself highlights the drawbacks of the model. See **page 1101**.

Drawbacks aside, this study is a crucial step towards the development of a rigorous model to chart the trajectory of the mahogany seed. Something, whose hypnotic helix has entranced children, philosophers and thinkers alike for hundreds of years.

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