In this issue

Transition in Dwellings

From the time that our primate ancestors climbed down from trees and started taking refuge in caves against the vagaries of weather to when they started constructing dwellings from naturally available materials, thousands of years passed. Within a few hundred years, dwellings evolved and adapted to local weather and climatic conditions. But it took only a few decades for cement, steel, aluminium and glass to transform dwellings all over the world to monotonously uniform structures. Packed one on top of another, modern day humans in multi-storey buildings look down on the tall trees that housed our ancestral species.

The recent transition in human dwellings has impacted traditional societies in Asia and Africa, points out a Review Article by researchers in IISc Bengaluru. They examine the nature of the transition, its drivers and the consequences: loss of traditions, increased material and energy demand and contribution towards climate change.

Flip to **page 29** in this issue and read the article before you start thinking of constructing a house.

Crystallisation of Minerals

Molecular processes

For those who have made copper sulphate crystals in labs, making crystalline minerals may seem an easy and simple process: a super saturated solution and a very small crystal as nucleus. But engineering other mineral crystals is not as facile as it may seem from this example.

It is only in the last three decades that clues to the molecular processes behind the formation of mineral crystals have started to emerge. A Research Account in this issue unravels the history of the discoveries on the one hand, and, on the other, spells out the molecular processes involved in the formation of metal salt hydrates of the first row transition elements to which copper belongs: manganese, iron, nickel and zinc. Using retroanalysis of known crystal structures and their formation, the authors tease out the interplay of atomic and molecular interactions and the geometry of close packing that creates stable periodic assembly of crystalline minerals. The mechanistic pathway unveiled is useful to understand the formation of any inorganic or metal organic solid grown from a solution.

Turn to **page 39** for some interesting insights.

Swertia chirata Xanthone

Action on colon cancer cell lines

Xanthones are a class of heterocyclic organic compounds produced as secondary metabolites by plants, fungi and lichens. A tri-hydroxy-methoxy derivative of xanthone extracted from *Swertia chirata*, a plant considered medicinal in Indian and Chinese traditions, has been recently shown to have therapeutic potential for skin and breast cancer through tests on cancer cell lines. A Research Article in this issue continues the story to demonstrate its anti-proliferative activity on various colon cancer cell lines.

While this xanthone derivative has no toxic effects on normal cells till about a concentration of 60 micromolars, it is active against cancer cells even at 5 micromolar concentrations. This selectivity, the Research Article goes on to demonstrate, is due to the higher amounts of reactive oxygen species induced in cancer cells by the xanthone derivative. Which, in turn, leads to apoptosis or the programmed death of cancer cells.

Moreover, the xanthone derivative has a synergistic effect when combined with chemical anticancer compounds such as 5-flourouracil, points out the article on **page 47**. A perfect setting for integrating traditional Chinese/Indian and modern medicine.

India has an average incidence of about 40,000 new cases of colon cancer per year. Prolonging the lives of human beings by integrating the herbal remedy into cancer treatment may ring the death knell for the survival of *Swertia chirata*, a plant that is already threatened by overexploitation. Thus, there is an urgent need to find fungal factories to produce the xanthone derivative.

Stratospheric Gravity Waves

Intrinsic frequency spectrum

Mountains, convection currents, wind shears and other atmospheric phenomena can set off gravity waves. Measuring the wave number and frequency spectra of gravity waves in the troposphere can easily be done using a variety of techniques – aircraft, balloons, lidar, radar, rocket sounding, satellite observations... But measuring these parameters of gravity waves in the stratosphere is not as easy.

Enter zero pressure balloons from the TIFR balloon facility at Hyderabad. On 13 September 2019, a zero pressure balloon, laden with measuring instruments, took off and climbed a wavering path, past the tropical easterly jet at about 16 kilometres, past the tropopause at about 18 kilometres, to a height of 31 kilometres. There it met the fast westerly winds. To enable recovery of the instruments, the researchers terminated the experiment, but not before the team could record adequate initial data on gravity waves in the stratosphere. In a Research Communication in this issue, they present the results of the path breaking experiment.

The results are from only about a hundred kilometres of horizontal drift of the balloon in the stratosphere, they point out. So now they are getting ready for a more daring experiment, launching a balloon from the Andaman Nicobar islands, to recover the instruments in the Indian mainland and thus to cover about 1500 kilometres in the stratosphere. Turn to **page 98** for more excitement.

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