

## In this issue

### Paradigm Shifts in Geology

Science does not always progress in small steps. Sometimes it takes huge leaps. At such times, firmly held beliefs are overturned almost overnight, it may seem. T. S. Kuhn calls this phenomenon paradigm shift.

In a General Article in this issue, C. P. Rajendran examines the history of geology – how it evolved through representative, interpretative and explanatory stages to become a scientific discipline that hesitantly predicts (forecasts) the future from past understandings of the planet – a scientific discipline that draws other disciplines into its fold to enlarge its scope.

What are the historical stages that geology has gone through? And what are the paradigm shifts that happened at the various stages of the development of the discipline from Geology to Earth Systems Sciences? Read on from **page 927**.

### Courting Controversy

Debates and discussions are useful in a democracy. In science, they are an absolute necessity. Your favourite journal actively seeks to create a platform for converting controversy into scientific consensus.

In a Review Article in this issue, Deepak Pental, South Delhi Campus of the University of Delhi, brings out the relative merits of various plant breeding technologies and points out that, without gene modification technologies, it is impossible to meet the nutritional requirements of our growing population. He questions the stance against genetically modified crops adopted by Green Revolution stalwarts and civil activists.

Read on from **page 932** and come back later to keep up with the debates that are bound to follow.

### Patents that Work

Even after a patent is granted, it can be revoked. Even if it is not revoked, it may not be picked up for commercial use. Out of the millions of patents granted every year the world over,

only a portion ultimately emerges as technology that works. Thus many patents die naturally, since they have a lifetime of only 20 years.

In a Research Article in this issue, Vikram Singh and Kajal Chakraborty, both from ICAR institutions, examine the case of working patents in India. They mined 2012–13 data from the Indian Patents Office and selected 64 national and multinational companies to understand trends and patterns in different sectors – agriculture, biotechnology, communication technology, engineering solutions, food processing, motor parts, pharmaceuticals and patent services.

The duo presents their findings on **page 1032**. Read on to see how many patents saw the light of day and how many didn't.

### Do Dogs Count?

The number sense – distinct from the ability to discriminate between more and less – is common among humans. But what about man's best friend? Can dogs count?

Anindita Bhadra from IISER Kolkata and Arunita Banerjee, her student, devised a series of experiments to find out. They tried to enlist more than 300 street dogs, but only about 270 dogs participated in the experiments.

Tempting the dogs to discriminate between different quantities of biscuits and chicken salami in cellophane covers, they prod the dogs' ability to count. After all, the ability to count determines the safe survival of puppies.

Want to know the results? Turn to the Research Communication on **page 1095** in this issue.

### Pollination in Mangroves

Though mangroves are important as a distinct ecosystem, the study of their reproduction has focused on their seedlings and dispersal. Kakali Bhadra at the University of Kalyani and her student Udipta Chakraborti were curious about mangrove polli-

nators. How are mangroves pollinated? Is it self-pollination or are they genetically obliged to cross fertilise? Which insect pollinators should we conserve to conserve mangroves?

They focused their research on four dominant species in the Indian Sundarbans – *Avicennia officinalis*, *Avicennia marina*, *Aegiceras corniculatum* and *Aegialitis rotundifolia*. To observe and experimentally intervene in the pollination processes of the four, the researchers waded several times, from 2016 to 2018, through the slushy Sundarbans to five small islands.

See their surprising results in a Research Article on **page 1060** in this issue.

### Measuring Ocean Winds

The surface wind over oceans is an important parameter that helps us understand ocean waves and predict important meteorological phenomena including cyclones. One could use the data provided by ships and floating buoys. But these provide spatially discrete data. Extrapolations from such data can often go wrong. That is where scatterometers carried by satellites come in to support scientists.

In 2016, ISRO launched India's SCATSAT-1 with a scatterometer that was an improved version of the first one launched a few years earlier. Every two days, the satellite goes over us, sending a pencil beam of electromagnetic waves at 13.515 GHz and analysing the signals that go back.

A Special Section in this issue is the starting point for nine research papers on the topic. Read on to understand how the data can be used for various purposes – to estimate river water levels and to detect flooding, to estimate relative soil moisture and the stages of rice crops in the *kharif* and *rabi* seasons...

K. P. Madhu

Science Writing Consultant

[scienceandmediaworkshops@gmail.com](mailto:scienceandmediaworkshops@gmail.com)