

## In this issue

### Insects and Humans

#### *Relationship networks*

About 80 per cent of the crops that humans cultivate depend on insects for productivity. Evidently, if not for insects, humans would not have grown to a population of more than 8 billion.

A General Article in this issue examines the role of insects as pollinators of our crops, as protein rich food with abundant essential amino acids and fatty acids, as biocontrol agents, as scavengers, as model organisms in our research labs, as therapeutic agents, as providers of raw material for industrial products and as topics for myths and stories.

Insects co-evolved with the first land plants, more than four hundred million years before humans. The evolution from segmented, soft-bodied, many legged creatures to six legged creatures was driven by continuous cephalization, the concentration of neurons in the head – the same evolutionary pressure that led to the evolution of the two-legged human. To read about our co-travellers in the journey on our little blue planet, flip to **page 241**.

### Leprosy Treatments

#### *Past, present and future*

In spite of rapid advances in the treatment of bacterial infections in the last eight decades, the treatment of infections by *Mycobacterium leprae* and *Mycobacterium lepromatosis*, the causative organisms of leprosy, is still difficult. The first limitation that researchers face is the inability to culture these organisms *in vitro*. Even *in vivo*, *Mycobacterium* species grow very slowly. Moreover, there are no effective bio-markers to distinguish the different types and stages of leprosy.

In spite of these hurdles, drugs to cure leprosy have been created and, in the last decade, incidences of new cases

of leprosy have remained steady. Most cases that are diagnosed have been cured by the multidrug therapy recommended by the WHO. But, since the treatment period is long and the patients have to bear with the side effects of the drugs, there are many who stop medications, creating complications, including the faster development of strains that are drug resistant.

Though the issue of drug resistance has momentarily been overcome by drugs for the second line of treatment, the challenge remains. There is a need to step up research on treatments for leprosy.

The Review Article on **page 253** in this issue draws the baseline in leprosy treatment today, including descriptions of presently used drugs, and explores alternative strategies for treatment such as immunotherapies and vaccines. New directions for research are also recommended.

### Mapping Mangrove Forests

#### *Multispectral satellite data*

Using multispectral remote sensing data from satellites, it is now becoming possible to not only map vegetative cover in inaccessible regions, but also to distinguish between plant populations in the region. Doing it manually requires expertise and is tiring. The solution is automation.

In a Research Article in this issue, you will read about a reasonably successful attempt at understanding the extent of mangrove forests in five locations in India: The Gulf of Kutch in Gujarat, the Thane Creek in Maharashtra, the Godavari River delta in Andhra Pradesh, Bhitarkanika in Odisha and the Sundarbans in West Bengal.

The researchers downloaded Landsat 8 multispectral data from the Google Earth Engine big data platform for the period between November 2019 and

February 2020 and merged it with ISRO's digital elevation data, CartoDEM, to take into account the tidal inundation of low lying areas. After cloud masking, they extracted spectral geometric and textural features. Using backward feature elimination, they performed a rule-based extraction of mangroves. Google images and field knowledge were used for ground truth.

The automated process of the detection and mapping of mangrove forests in India varied between about 81 per cent for the Godavari delta, 94 per cent for Thane Creek. Good enough to remotely monitor the expansion or contraction of areas under mangroves. Turn to **page 299** for details.

### When Greenery Turned Barren

#### *Palaeobotany at Barmer, Bikaner*

As per geologists, the Gurha lignite mine in Bikaner and the Kapurdi clay mine in Barmer belong to the Palana Formation. The region, formed about 56 million years ago or so, is in the barren part of Rajasthan today. But researchers from Birbal Sahni Institute of Palaeosciences recently dug up fossils, clues to the past, from the mines and fossil flowers, fossil fruits and a morphotype of pollen that they analysed so far show that the region was thriving with flowering plants, or angiosperms, earlier.

Angiosperms had overtaken gymnosperms by about 66 million years ago or so and had diversified and expanded their habitats. The arid region around the mines today must have been lush green then. What plants were there at that time? Read the paleobotanists' account in a Research Communication on **page 321** in this issue.

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