In this issue

Joining the Dots

Tribal perceptions of astronomy

When you look up at the sky at night, you may mostly see a handful of stars blinking blithely in the night. If you are in an area without light pollution, you are greeted by a star studded sky with billions of stars.

Our ancestors used 'join the dots' to create patterns in the sky and made up stories around the 'constellations' so formed. Later, these dots in the sky were used to gauge time, to understand the solar system and for navigating across the globe. The understanding thus generated sparked questions of one's existence, raised concerns about faith and contributed to the progress of culture and civilization.

Although primitive astronomy began about 15,000 years ago, it is only in the last 500 years that astronomy expanded the limits of human understanding of the universe. However, there are many who have not been touched by the progress in astronomy.

A team of scientists from the Tata Institute of Fundamental Research studied four such tribes from Central India: Gonds, Kolams, Banjaras and Kukrus.

These tribes are still secluded from modern human settlements and live in harmony with nature. The scientists recorded the knowledge of constellations possessed by these people and found how closely the tribal narratives about constellations are dominated by their culture, environment and lifestyle. Read more in a General Article on **page 1041** in this issue.

Cardamom Conundrum

On the southern side of the High Ranges in the Western Ghats, where the highest-altitude tea plantations in the world are located, there are some smaller hills, the Indian Cardamom Hills, famous for cardamom. These hills, spread over more than a thousand square kilometres, offer an ideal ground for perennial mixed agroforestry systems.

The introduction of high yielding varieties of cardamom improved the productivity of the hundred odd farmers. More than 95% of the total area under cardamom cultivation now, grows one variety – 'green gold'. The variety responds well to fertilizers and performs well under more open forests. So farmers lop the trees to allow more sunlight. The practice dries up the surface and reduces pests. But the variety is a heavy consumer of surface soil nutrients. It is succulent and, thus, more attractive to insect pests: the shoot and capsule borers, thrips, root grubs and whiteflies.

Thus, ultimately, farmers end up using more fertilizer and pesticide. A General Article on **page 1058** in this issue looks at the relationships, within the ecosystem of trees, cardamom, pests and the climatic and meteorological variables, to seek a solution.

Architects of Soil

Earthworm as ecosystem engineers

During the monsoons, the dry dead ground is abuzz with activity. New blades of grass shoot up out of the soil. Birds become regular visitors in the backyard where earthworms are found crawling about on soil and gravel.

But, for the most part, the earthworms remain hidden underground.

Down, below the surface of the earth, these worms change the texture of the soil. The burrowing activity of the earthworms, their secretions and faeces have an effect on soil architecture, porosity and water retention capability. Earthworms help release the locked carbon and nitrogen in organic matter which makes the earth more fertile. This has earned them the title of soil engineers.

About 6000 species of earthworms have been recorded worldwide. But due to lack of adequate knowledge of their specific actions, we are unable to make use of nature's very own service providers. Now scientists have gathered and consolidated data that highlights the role of earthworms in improving soil characteristics. By determining the economic value of these ecological services, policies on soil management can be improved, they suggest. In a Review Article on **page 1064** find how nature's very own ecosystem engineers plough and till the soil.

Seeing inside Clouds

Light detection and ranging (LIDAR) – a simple trick in remote sensing – throws light, and examines whatever is backscattered, to get some idea of what is causing the backscatter.

Scientists at the National Atmospheric Research Laboratory, Gadanki tweaked the trick a bit to look into clouds. They used both photon count from the back scatter as well as the analogue measurement of the photomultiplier and glued the data together to reduce the turbid character of the air between the clouds and the instrument.

If you use a linearly polarized second harmonic Nd : YAG laser and collect parallel and perpendicular polarization components of the backscatter separately, you can 'see' the atmosphere in a different light – from the ground up to 30 kilometres, with a resolution of about 30 metres. And if you look through this dual polarized LIDAR, you can see into the clouds, and distinguish water from ice, because the ratio between the parallel and perpendicular polarized backscatter is near zero in the case of spherical water droplets. Ice crystals and aerosols, that are non-spherical, have higher values.

In a Research Communication on **page 1134** in this issue, researchers from IIT Bombay, the VIT University, Vellore and NARL, Gadanki compare their results with the data on the same set of clouds from the CALIPSO satellite. A low-cost ground-based instrument can do as good if not better than a satellite when it comes to cloud gazing.

Sarah Iqbal and K. P. Madhu
scienceandmediaworkshops@gmail.com