In this issue

Solar Energy in India

Solutions for self-reliance

The solar panels that we see now-a-days are mostly made of modules containing polycrystalline silicon. The cost of pure silicon is nearly a fourth of the cost of the panels. Considering India's inability to produce any silicon, use of other materials is a necessity, points out Amlan J. Pal, Indian Association for the Cultivation of Science. He examines the cost per watt of such silicon-based solar cells and compares it to that of other available solar cell technologies – thin films, new absorber materials, perovskites and related materials.

Many of the anxieties related to the use of perovskite materials for solar panels have been addressed recently. With new absorber materials, the efficiency of the technology is catching up with that of silicon wafer cells. So we may start seeing perovskite-based solar panels sooner than later. But thin film technologies with cadmium telluride and copper zinc tin chalcogenide may have a more immediate impact on solar energy production in India.

The manufacturing process for thin films that use cadmium telluride or copper indium gallium (di)selenide is easier, less costly. While silicon wafers need to be 200 μm thick, the thin films are only about 1 μm. Though the life span of these films may be lower than that of even metallurgical grade silicon cell modules, considering the costs per watt, adopting thin film technology will be advantageous, says the author.

To achieve the 2022 target of producing 100 GW solar energy, India may have to focus on installing time-tested and dependable silicon solar modules. In parallel, foundries for thin-film technologies should also be set up. Though, in the initial years, contribution from these thin-film modules may not be very significant, in the long run, this would prove to be a cost-effective solution to self-reliance in solar cell technology. Besides generating employment, this will provide energy at an affordable cost. See the suggestions for a road-map for solar energy in India on **page 714**.

Kerala Floods of 2018

Why damn the dams?

The recent floods in Kerala generated a lot of media reports. People wanted to know what caused the floods. The flurry of answers that followed included the non-religious attitudes of Keralites, solar activity, environmental degradation of the Western Ghats and dams. Scientific evidence is rarely taken into account in such blame games.

It is obvious that heavy rainfall in a short period of time was the immediate cause of the floods. The release of waters from dams can compound the effects. Now researchers from the IIT Madras provide evidence to settle at least a part of the controversy. In a Research Article on **page 780** in this issue, they examine the role of dams in the floods of 2018.

Converting blame into a hypothesis and testing it rigorously to falsify it, the researchers show how socially prevalent emotional reactions are often unjustifiable.

Soilless Farming

Soil has been the soul of human agricultural practices for at least ten thousand years. In the last few decades humans extracted as much food as possible from soils, using fertilisers, pesticides, weedicides and improved methods. And in the process, learned more about plant physiology than earlier humans had done, in thousands of years. Including the possibility that dependence on soil may be the next bottleneck in the endeavour to feed billions.

Researchers from the Regional Plant Resource Centre, Bhubaneswar examine available options in a General Article on **page 728** in this issue. They explain open farming culture including root dipping, hanging bag and trench method techniques as well as closed farming culture including hydroponic, nutrient film, aeroponic and aquaponic techniques.

They describe a few large scale implementations of some of these techniques and elaborate on the parameters to consider in soilless farming and to make it ecofriendly.

The next generation green revolution will come from soilless farming, they say.

Sundials of Srirangapatna

The evolution of the practice of time-keeping from the position of the sun to more precise measurements using shadow clocks to sundials, took thousands of years. Sundials remained the most precise technology to measure time for another two or three thousand years. Mechanical clocks and watches did not survive even a few hundred years. And in the day of digital watches, who would stoop to look at sundials?

Physicists and astronomers from Jaipur examine two sundials found in Srirangapatna – one at Hyder Ali's tomb and the other inside the Jamia Masjid. They double checked the accuracy of the sundials using modern techniques. They also provide an interpretation for the significance of the markings on the sundials.

Though time has ravaged these archeologically protected sundials, they are still in usable condition. And they are capable of marking out time, so necessary to initiate the call for prayers. Except, of course, when the sun is obstructed by constructions that came up after the sundials fell to disuse, when mechanical watches entered Srirangapatna.

Next time you go to Srirangapatna, you will perhaps allocate time to look at this ancient time keeper. But before that, read the Research Communication on **page 811**.

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