

## In this issue

### Devasthal Optical Telescope

In the 1970s and 1980s, results from the one-metre and the 2.3 metres aperture telescopes at Kavalur, Tamil Nadu whetted the appetite of Indian astronomers for a telescope with 4-metre aperture range. In 1976, the Uttar Pradesh Government agreed to the project in principle. But it took four decades for it to materialise. In 2016, the 3.6 metre optical telescope became operational, at Devasthal, near Nainital.

A General Article in this issue traces four decades of the project's history, from conception to inception and execution, examining the social, political, economic, technical, environmental, infrastructural and scientific aspects of a dream coming true. It is an article that leaders and managers of science in India need to read – to draw parallels, to extract lessons learned, to avoid similar pitfalls. To get inspiration on how intense aspiration, dedicated work and immense patience does pay off, read on from **page 365**.

### Wild Life Conservation

#### *Corporate social responsibility*

In the past, many Indian tycoons and millionaires have turned philanthropists and contributed to social causes – education, health, livelihoods... But not all businesses pay forwards to society and ecosystems. Clause 135 of Companies Act 2013 made it imperative for companies that cross a specific limit in either net worth or turnover or profit, to invest a specific percentage of their profits in well-demarcated socially and environmentally relevant activities. Suddenly, about 6000 companies in India found themselves in a situation where they have to choose from a given menu to invest more than three billion dollars.

Anju Baroth and V. B. Mathur (**page 405**) from the Wildlife Institute of India review how business houses and companies in India have invested to meet regulatory social obligations in an area that was not under the radar of most companies: wild life conservation.

Conservation efforts for the whale, shark, turtle, red panda, snow leopard,

tiger, eastern swamp deer, vulture, dolphin and other endangered species have received a fresh boost because of this. Companies are coming forward to help reduce human–elephant conflict, to support research on marine and river ecology and several other conservation related causes.

Through the review of a few companies, the researchers show thousands of others who are still floundering what to do with the funds for CSR – what can be and needs to be done in the area of wild life conservation.

### Aerobic Granular Sludge

#### *Wastewater treatment*

A Review Article on **page 395** in this issue points out that class I and class II cities of India produce about 75 billion litres of wastewater. And that wastewater treatment plants treat only about 26 billion litres. The land area needed for wastewater treatment plants, cost of construction, operation and maintenance are major hurdles that come in the way of stopping wastewater from contaminating freshwater and groundwater resources.

Wastewater treatment using activated sludge is about a hundred years old and improvements have been incremental and minor so far. But, the authors point out, research results from the last two decades show a potential new technology that can make wastewater treatment much cheaper and faster.

In the traditional wastewater treatment, nutrients such as nitrogen and phosphorus are removed using microbes maintained in the form of flocculent-activated sludge. This loosely dispersed bacterial community has to settle by gravity, the water has to be clarified... All this takes time and a large amount of land area and complex technology.

One could use biofilms formed on solid surfaces by these microorganisms and make sure that the wastewater comes into contact with them. Bacterial biofilms grown on surfaces can be removed more easily. But even then, there is a need for settling and clarifications because the microorganisms

detach from the biofilms and flocculate.

There is another structural organisation of these microorganisms: aerobic granular sludge. These are naturally formed in sequence batch reactors in wastewater treatment plants. The compact granules contain large populations of microbes and are hence faster in removing pollutants. They also settle faster and do not require secondary clarifier.

Besides a pilot scale reactors set up for testing the concept, full scale wastewater treatment plants based on the technology have been established in the Netherlands and in China. India, too, needs to leverage on this new technology to reduce the gap between sewage generation and treatment capacity, say the authors.

### Security of Medical Images

Patient records are to be kept confidential. While the digital records of medical images from various types of scans are sent to experts for diagnosis, there are security issues that threaten patient confidentiality. Umamageswari and Leo Vijilious from the DMI College of Engineering, Chennai, examine approaches adopted for the digital security of medical images. And suggest a robust method against security threats.

The method uses a secret key for embedding and extraction to assure the authentication, integrity, and reliability of grey medical images. Read the research Article on **page 412**.

### Redefining Agroclimatic Zones

#### *In the era of climate change*

In the early 1990s the Indian Council of Agricultural Research divided the country into 127 agroclimatic regions based on rainfall, temperature, soil characteristics etc. But the climate is changing. Changes in rainfall and maximum and minimum temperatures may call for a revision of the divisions of agroclimatic zones, say researchers from IMD Pune, in a Research Communication on **page 480**.

K. P. Madhu  
*scienceandmediaworkshops@gmail.com*