

In this issue

Evolution of Science

Brainy man minds matter

How did humans evolve? What were the evolutionary pressures that led to emergence of consciousness? What were the factors that led humans to colonize the whole earth?

How did science evolve? What are the patterns in the creation of knowledge? Are there limits to the pursuit of scientific knowledge?

Recent discoveries on human genetics, archaeology, anthropology and history intertwine to entertain and enthrall us. And the need to tell the story that led us to where we are, and to place the new understandings in their context, is a compulsion – to prepare us to the journey ahead, to face the challenges yet to come...

On **page 1456** in this issue, Mahank N. Vahia, an astronomer from TIFR takes the temptation by its horns. In a two-part article, he gives a quick sketch of the essential points on a vast timeline and takes a peep at the future in the light of the past.

Astronomers of the past, such as Arthur Eddington and James Jean too, had given in to such temptations to step into philosophical speculations in their late life, striving to conquer unanswered questions that do not respect boundaries of academic disciplines.

Antibiotics from New Sources

Fungi from marine sponges

From the time Alexander Fleming discovered that a fungus can be useful in producing antimicrobials, the search for potential antibiotics amongst various fungi has continued unabated. Most of the known terrestrial fungi go through the screening for antibiotics some time or the other.

But there are fungi in marine environments too. Can we now start looking at these potential but unexplored sources, given the rapidity with which antibiotic resistant strains are developing?

Scientists in Sri Lanka have taken their first steps in this direction. They took a marine sponge – sponges have often fungi associations. They chopped the sponge into small pieces and cultured them in different media to isolate the fungi that grow on the sponge.

Then they checked the antimicrobial activity of these fungi. And guess what? There were potential sources for antibiotics amongst the fungi that grow in sponges.

Using the DNA databases they were able to identify the fungi that have such properties. And ultimately they were also able to isolate and identify the antibiotic molecules. Read on from **page 1473** in this issue.

Discussing *Gambierdiscus*

Two-spot red snapper toxic?

A disc shaped marine unicellular organism that moves around by swirling their flagella was discovered near Gambier Island in the Pacific, half a century ago. These are very ancient organisms, dinoflagellates of genus *Gambierdiscus*, that still survive in the tropical seas and oceans.

They produce certain polyether toxins. These toxins are lipid soluble. So they tend to accumulate in the other organisms that eat it. They are called ciguatoxins since these were identified in sea snails (cigua in South American Spanish).

These toxins are quite stable and so they tend to go up the ladder of food chain. So quite a few fish species are also known to carry ciguatoxins. They tend to accumulate especially in their head, viscera, roe and skin.

Humans eat fish. Ciguatoxins are colourless, odourless and heat stable: they are not destroyed by cooking. So there have been many cases of acute poisoning. People who eat the fish show symptoms such as abdominal pain, nausea, vomiting, diarrhoea, itchy skin, hot and cold sensations, numbness, tingling in the extremities and other neurological symptoms. The symptoms may start within half an hour and, in certain cases, continue for months.

There have been many such cases reported especially from the Pacific region where it is called ciguatera fish poisoning. In a Research Communication on **page 1543** in this issue, scientists report the first two cases of ciguatera from Mangalore, India.

The scientists took a sample of the fish that caused the poisoning and by DNA finger printing, the fish was

identified as *Lutjanus bohar* (two-spot red snapper). Since ciguatoxins are known to exist in tropical marine environment, fish eaters in India may also need to take more care. Fisheries research stations in coastal areas of India may need to monitor the ciguatoxins content especially in carnivorous fish among regional catch for clarifying the potential risk to fish eating populations in India.

Neural Networks in Mining

Flyrocks caught in the net

Blasting, an integral operation in mining is a risky business. To free the ore from the rockmass explosives are loaded in blast holes and then *BHAM*. The blastholes release the rock thereby enabling extraction of ore by machineries. But not before throwing some rocks around. Miners know this. But what catch them unawares are flyrocks that literally fly unexpectedly and cause accidents. These are difficult to predict.

Scientists from the CSIR-Central Institute of Mining and Fuel Research, Nagpur, and the Indian School of Mines, Dhanbad, tackled the problem with tools that have proved to be useful in dealing with problems that deal with the such unpredictable phenomena: artificial neural network.

The scientists collated data on different variables and factors of blasting from ten mines in India and created a database. They trained an artificial neural network on this data. Initially it did not work as expected. But when scientists repeated the training by separating the data on the rocks that are thrown and the rocks that fly, there seemed to be great improvement. They went on to check various other variables that may have to be independently considered. Thus a clearer set of parameters that should be taken into account in each blast site have emerged.

The modeling technique can be tuned to different mining conditions. This is a welcome addition to the mere gut feeling of experienced miners to reduce the accidents in mining areas. See **page 1524**.

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