In this issue

Protein Structure and Function
Hydration holds the key

Proteins in living systems are hydrated. Even when proteins are purified and lyophilised to solids, some water molecules remain. These water molecules are necessary for the proteins to sustain their structure and function.

Till recently, investigations on the issue had to rely primarily on computer simulations. But now with the availability of atomic resolution X-ray crystal structures of proteins and improvements in structure determination with synchrotron radiation, the Protein Data Bank has accumulated enough data to open up another line of inquiry.

In a Research Article in this issue, M. R. N. Murthy from IISc examines the degree of protein hydration in twelve representative protein structures with better than one angstrom resolution. The position of water molecules relative to various moieties and atoms, interactions that stabilise the water molecules and distribution of water molecules in different hydration shells, provide insights into their role in the structure and function of proteins. Read on from **page 186**.

Heavy Metal Pollution
Through idol immersion

In a Research Article on **page 200** in this issue, researchers from the Bharathidasan University report that the ritualism of immersing idols in the river is causing heavy metal pollution in the Cauvery river basin. Studying the water quality there from August to October 2018, they find tell-tale increases in heavy metal concentrations due to idol immersion.

The river basin already has a fair share of pollution from industrial, agricultural and urban activities which are difficult to control since they are linked with local economy. Though idol construction is also an economic activity, substitution of eco-friendly, metal-free raw material in the making of these idols can save the holy river from further degradation.

Manned Space Flights
Crew escape system

5 July 2018. Sriharikota. A rocket weighing more than twelve and a half tonnes roars and takes off. The first 260 seconds of the flight are monitored and recorded by 300 sensors. The rocket reaches an acceleration of 10 g by the time it reaches 3 kilometres over the Bay of Bengal. Suddenly, the crew escape system is activated. Five solid motor engines roar into action to separate the crew module from the rocket, parachutes open up and the module drifts down. Boats rush to recover the crew module.

The engineers and scientists at ISRO sigh in relief. Everything went as planned.

India is planning for manned space flights from 2022. The drama that played out in July 2018 was a test for preparedness for all eventualities. In twelve articles in this issue, you will read about rocket technology – structural design, aerodynamics, aero-thermal design, instrumentation, special escape motors, propellants, parachute systems, grid fins... All that is critical for the safety of the crew in planned missions. Turn to the Special Section on **page 79** to satisfy your curiosity.

Long-lasting Research Papers
Citation-based identification

India now produces more than 1.5 lakh papers per year. Many will never be cited. Some will get a large number of citations immediately after publication, and then citations will taper off. In absolute contrast to this 'flash in the pan' phenomenon, there will be sleeping beauties – papers that start getting citations after a decade or more, and then, suddenly, their citations hit the roof.

There is a fourth category – papers that attract attention immediately after publication and continue to garner citations for decades. It is the search for this category of papers from India that led Shubhada Nagarkar and Shridhar Gadre from the Savitribai Phule Pune University to examine the citation data of a total of 123,993 papers with at least one Indian as author, published in the decade between 1985 and 1994.

They developed a protocol for tackling the problem: remove all entries that have received less than 100 citations till 2019; examine the citations of only the 1367 original papers that remained; remove flashes in the pan and sleeping beauties. Thus, they identified 676 papers that potentially may have long lasting impact on scientific research.

Now they are ready to answer some interesting questions. Can patterns in citations for the first few years help predict long term performance? Do publications in high impact journals have an edge over others to reach the category? To which subject areas do such long lasting contributions from India belong? Turn to the Research Communication on **page 209** in this issue, for answers.

K. P. Madhu
Science Writing Consultant
scienceandmediaworkshops@gmail.com