

In this issue

Duality, Symmetry, Completeness

Cornering concepts in science

Duality exists in the ordinary day-to-day notions of good and evil, true and false, male and female... The dualities in science, however, are defined more rigorously and the tradition is to anchor concepts to observable and, if possible, measurable quantities.

Varun S. Bhatta and Sundar Sarukai, examine concepts of duality in philosophy, logic, mathematics and in various sciences. To bring clarity, they introduce and contrast similar, complementary and supplementary concepts such as symmetry and completeness. The authors stress the centrality of the concept of duality in science, given its pervasiveness across many disciplines.

Masters and Doctors of Philosophy will now get to read some essentials of philosophy in the General Article on **page 705** in this issue.

Geospatial Modelling

Health care in Manipur

More than 50 per cent of the population in Manipur lives in Imphal. The rest is scattered in hilly terrains. With the given topography of the region, it often takes an average of about two to three hours for a patient from remote and hilly regions to reach any healthcare location. It is not that Manipur does not have healthcare facilities. It is just that most are located within a radius of five kilometres from Imphal's city centre.

To provide universal health coverage and accessibility to quality healthcare services at affordable cost calls for a more equitable distribution of PHSCs, PHCs and CHCs based on the distribution of populations within the state. Where should we be establishing new health care facilities?

Researchers from the Jawaharlal Nehru Institute of Medical Sciences and NIT Manipur geotagged all public health care facilities and most private ones too, in a GIS platform. They used AccessMod software to evaluate the accessibility of the existing network of healthcare facilities, taking into ac-

count human population, land use land cover, road network, topography and physical barriers like rivers and mountains. In the model, they assigned a maximum travel time of 60 minutes for PHSCs, 90 for PHCs and 120 for CHCs.

The Research Article on **page 728** in this issue spells out the methods to find appropriate locations for establishing new healthcare centres in any State or Union Territory. And the results are available for some serious evidence-based decision making in Manipur.

Building in the Ganges Basin

Behaviour of foundations

The Ganges basin is one of the most populous regions in the world. The alluvial soil in the region is notorious for amplifying the effect of earthquakes. The liquefaction of the soil in response to strong pressures of Himalayan earthquakes makes buildings in the region vulnerable. Traditionally, raft foundation, where concrete is used like a mat on top of the soil, is useful to absorb the stress and strain of ground movement. In a Research Article in this issue, a research scholar, two faculty from IIT Dhanbad and two engineers trained by them come together to investigate the behaviour of the raft foundation during earthquake loading especially in liquefiable soils.

The team modelled a four storey building with raft foundation on a soil profile commonly observed in the Ganges basin and analysed the effects of earthquake loadings. The results will make the urban development authorities sit up and think. Turn to **page 759** for more.

Haemoglobin Variants

Glucose, glutathione modifications

Haemoglobin in human red blood cells has many variants. The covalent binding of glucose with normal haemoglobin results in glycated haemoglobin, a marker for diabetes. Similarly, binding of glutathione to haemoglobin signals the elevation of oxidative stress that is associated with several human disea-

ses. These modified haemoglobins have higher affinity for oxygen.

But what about other genetic variants of haemoglobin – haemoglobin E and haemoglobin D Punjab? What are the structural modifications of these variants when they get attached to either glucose or glutathione?

Researchers from the St. John's National Academy of Health Sciences and the Manipal Hospital in Bengaluru collected blood from diabetes patients with the normal and variant forms of haemoglobin. They also synthesized glutathionyl haemoglobin variants.

They predicted from the structural analysis that both glycation and glutathionylation of haemoglobin E will lead to stronger oxygen binding. However, in the case of haemoglobin D Punjab, while glycation may decrease, glutathionylation may increase the strength of oxygen binding. In a Research Article on **page 722** the researchers provide explanations for these phenomena.

Hair Today, Gone Tomorrow

It is quite disconcerting when you start losing hair in large quantities. People tend to worry about it.

Hair loss can be due to various reasons – genetic, endocrine, drugs, nutrition, fungal infections and autoimmune disorders, as well as environmental factors, besides methods of hair care and hair modification for cosmetic purposes. Some of these factors are controllable and hair fall can be reduced. Are people aware of these factors? How do they respond to hair fall?

Faculty and students from the Maitreyi College, New Delhi formulated a questionnaire to gain understanding and went around Gurugram, Faridabad and Delhi to collect a few hundred responses. Interestingly, though people lose their hair over hair fall, the majority are not aware of the reasons, nor do they take adequate steps. Read the Research Communication on **page 786** in this issue.

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