

In this issue

Vulnerability to natural disasters

Natural disaster ≠ Human disaster

Odisha has drawn the worst hand possible: *Super-cyclone 1999, Phailin cyclone 2013, The great floods of 1980, and 2001*. Billions of rupees worth infrastructure destroyed. Hundreds of thousands of lives washed away. Over the last 200 years, cyclones and floods have wreaked havoc in the state time and time again. And, akin to rubbing salt on an open wound, the intensity and frequency of these events are only going to increase in the near future because of climate change.

Consequently, to mitigate the impact of these events, a number of studies in the recent past have endeavoured to ascertain which of Odisha's districts are most vulnerable to floods and cyclones. By doing so, these studies have proven to be an invaluable tool to the Odisha government. They have aided policy makers to allocate limited funds to districts in an egalitarian manner, as well as to chalk out more effective disaster management modules. These studies, however, are rather limited in their scope. This is because (a) they only included those districts situated on the coastline in their assessments, and (b) they factored in only the biophysical components of vulnerability. The socio-economic components of vulnerability, such as how the lives of people are affected after their homes and lands have been ravaged, were not accounted for. A Research Article, **page 1997**, considers both these constraints, and strives to develop an 'integrated approach' to assess vulnerability of not just the coastal districts but of all the 30 districts of Odisha.

This 'integrated approach' of vulnerability measurement depends on the interplay of three variables – namely, exposure, sensitivity, and adaptive capacity of a particular district when confronted with a natural disaster. The value of each of these variables is deduced by examining suitable proxies, such as death toll after disaster strikes, number of houses damaged, tonnes of crops lost, etc. As all these proxies are measured in different units, they are normalized to aggregate into a single value before being analysed to estimate the vulnerability rank of the district; the results of this analysis are particularly noteworthy.

The study finds that out of the eight most vulnerable districts, surprisingly, five are non-coastal!

Galanthamine vs Alzheimer

Every four seconds someone is diagnosed with Alzheimer's...

The Alzheimer's disease, a neurological disorder, is the most common form of dementia. Today, more than fifteen million people are affected by it. It is one of the leading causes of death in developed countries, and also, economically, one of the most expensive disease conditions to treat. But what is particularly disturbing is the fact that even after a full hundred years since it was first described, this disease still remains incurable. Nevertheless, things are not as bleak as they seem.

In the recent past, many treatment strategies have been developed which significantly slow the progression of this disease. One particularly effective treatment strategy is the drug galanthamine.

Galanthamine is an isoquinoline alkaloid. It alleviates the symptoms of Alzheimer's by inhibiting the activity of a certain enzyme, acetylcholine esterase, in the brain, thus allowing the patient to stand the siege of this disease for a whole year. A year may appear to be a small window of time, but to the patient and his family it also means 365 days of good emotional and physical health – a bargain few would ever refuse. Regrettably, however, only a small fraction of the millions have access to this drug because its supply is limited.

Several problems limit the production, and hence the supply of this drug. First, the drug is isolated from rare Amaryllidaceae plant species which are difficult to cultivate. Second, the galanthamine isolation processes demand a high technological and intellectual capital. Third, chemical synthesis methods to mass produce this drug have proven to be impracticable – they are expensive, and have low yields. Fourth, and most important, owing to the rising demand, overexploitation is pushing the handful of galanthamine producing plants towards the edge of extinction. Therefore, there exists a need to not only sustainably manage these plant species, but also discover other potential sources of galanthamine. A Research Communication, **page 2008**, takes an important step in this direction by unearthing a rather intriguing revelation.

This study reports that the galanthamine yields of certain plant species

belonging to the *Crinum* genera are comparable to those of the Amaryllidaceae species!

Lego DNA

I don't know about dice, but God most assuredly plays with building blocks!

DNA is the building block of life. These clichéd words are charged with a strange dichotomy: something as non-living as DNA molecules moulds something as living as life. It is indeed the clay of life. There is, however, one other, perhaps more alluring, ramification of this statement.

If life simply comprises the building blocks of DNA arranged in a particular order, then it could be possible for human hands to create life. In effect, *the creation – Homo sapiens* – could become *the creator*, and even join the game of dice and building blocks.

Although such an idea may appear to be naively ambitious, over the last few years researchers have actually succeeded in artificially synthesizing DNA. In 2008, for example, a group headed by Craig Venter synthesized the complete genome of a bacterial species, *M. genitalium*. Later, in 2010, the same group went a step further and, by analysing computer records, not only synthesized the entire genome of another bacterial species, *M. mycoides*, but also transplanted it in a recipient *M. capricolum* cell. These bacterial cells – the first species to have a computer for its parents – exhibited expected phenotypic characteristics, and were capable of replicating billions of times.

Such DNA synthesizing studies may prove to be critical for the growth and development of humankind in the near future. In fact, as several of these studies report, by tailoring the DNA of viruses, bacteria, and diatoms, it may be possible to develop vaccines against deadly diseases; to create bio-fuel producing bacteria; and to even understand the more enigmatic nuances of life itself.

A General Article, **page 1975**, by delineating certain genome synthesizing methodologies such as the SCRaMble evolution system, discusses some of these studies in detail.

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