How is the mind shaped?

IN shaping the mind and brain, the debate about nature versus nurture, biology versus culture, genes versus environment remain unresolved. To some researchers, the idea that the spirit might exist apart from the body is just ridiculous. According to them, genes shape environment and brain chemicals shape behavior. The consciousness is created by the neuronal assembly, the organized fashion of the nerve cells which constitute the entire nervous system including the brain. To them, free will is just an illusion and human beings are nothing but "hard-wired" individuals preprogrammed to do this or that.

But how is it possible for the 30,000 genes to make a brain with billions of neurons and encode the particular aspects of cognition that make us human? A field called epigenetics has finally begun to address this issue, at least to some extent. It tells us how tiny molecules stick to or become unstuck from two main targets of a cell's nucleus- the DNA in and around a gene and the histones- the proteins around which chromosomes spool. The tiny molecules are known as methyl and acetyl groups whose presence or absence at target sites control whether particular genes will create proteins, which are then responsible to carry out the physiological processes, in most of the cases. This brings into light, the idea, that activity of the genes can be directly controlled by the environment and the process is known as epigenetic control. It says that, when we change our perception on beliefs, we send totally different messages to our cells and thus reprogram their expressions. However, things are not as simple as that. Though every cell of our body is innately intelligent, they function in cohort in the multicellular organization having as much as eighty trillion cells. This cohort generates a "central voice"- a character we perceive as the mind and the spirit.

The infinite potential of the human mind

Human mind is shaped by genes and the experiences

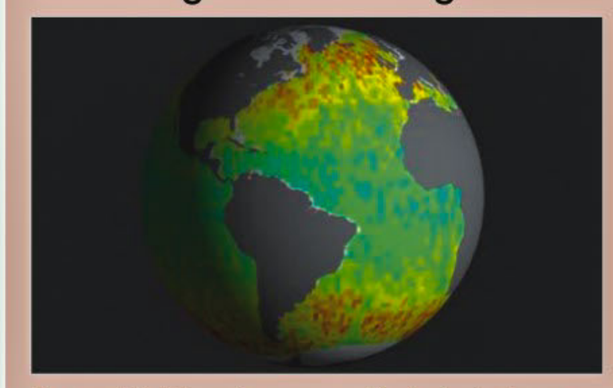
If we look at the developmental processes of the brain, we would see that nerve cells in the developing cells crackling with purposeful activity. Like teenagers with telephones, cells in one neighborhood of the brain are calling friends in another, and these cells are calling their friends, and they keep calling one another over and over again, "almost, as if they were autodialing", says University of California, Berkeley neurobiologist Carla Shatz. During the first years of life, the brain undergoes a series of extraordinary changes producing trillions more connections between neurons, shortly after birth, than it can possibly use. Then, through a process that resembles Darwinian competition, the brain eliminates connections, or synapses, that are seldom or never used. Nature is the dominant partner during this phase of development, but nurture plays a vital supportive role. When Eric Kandel, Columbia University neurophysiologist observed the twin processes of learning and memory in giant snails by blocking the activity of a protein CREB, he found that they could still learn but could not remember. And without forming long term memories, learning process fails. "Nurture is important," says Kandel. "But nurture works through nature."

Researcher Steven Cole of the University of California, Los Angeles, and his colleagues found that chronic loneliness triggers a change in gene activity. Again, physical training helps a person to become stronger, fight mild depression, lose weight, lower blood pressure, and to have more efficient heart and brain. The "anxiety gene" raises the risk of depression only when an individual faces difficult life circumstances which again illustrate the importance of an interaction between genes and the life experiences. Richard Dawkins once challenged readers "to teach generosity and altruism, because we are all born selfish." But we know altruism exists among people and we are not by born egoists. Perhaps we are born with the potential to be selfless and environmental interactions actually trigger the altruistic behavior. All of this affirms the notion that we live in a world of conscious choice gaining experiences from the environment. Conscious awareness, indeed, can actively transform the character of our lives into ones filled with love, health and prosperity rather than being hard-wired individual with particular sets of genes.

The writer is a Lecturer in Biotechnology at BRAC University

WINDY TREND

Global gale warning



The world's biggest waves and fastest winds may be getting even bigger and faster, a new analysis of roughly two decades of satellite data suggests

AS salty sea captains can attest, winds and waves can appear out of nowhere on the open sea.Now, an analysis of satellite readings suggests that winds may be picking up speed over oceans worldwide. The seven seas aren't getting gustier on the whole, but severe winds are getting stronger, researchers from Swinburne University of Technology in Melbourne, Australia report online March 24 in Science. That's bad news for sea captains, perhaps, but good news for surfers, since waves may also be getting higher, the team says.

The windy trend isn't necessarily surprising, says Peter Challenor, who tracks ocean conditions in the North Atlantic. Global climate change could theoretically make oceans windier or wavier, but weather often goes through natural cycles too, says Challenor, a researcher at the National Oceanography Centre, Southampton in England. Wind speeds in the North Atlantic, for instance, vary based on multidecade shifts in the atmospheric pressures over Spain and Iceland. What's surprising here is that the Australian researchers appear to have detected changes on a worldwide scale.

"We always assumed that each region was separate," Challenor says. "They've shown that everywhere seems to be going up, which suggests that there may be a global pattern."

The group analyzed 23 years of wave-height recordings and 17 years of wind data from seven different satellites. The fastest 1 percent of winds spiked the most over the period studied. These gales sped up in most locales by about 0.75 percent or more per year.

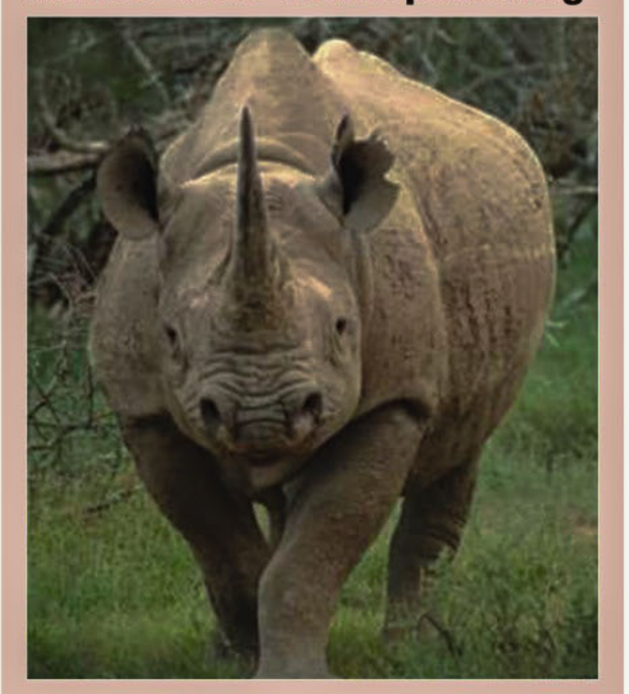
Waves didn't surge as much, although at high latitudes the biggest swells got about half a percent bigger per year. That mismatch isn't too shocking, says study coauthor Ian Young, a physical oceanographer and engineer now at the Australian National University in Canberra. A storm in one corner of the world can often make waves in another, he says. "A lot of the ocean wave conditions are swells which generate somewhere completely different."

Wave heights are relatively easy to record from space with radar, but wind speeds are a bit trickier, Young says. Winds don't just make waves, they also change water texture blow softly into your morning cup of coffee and you'll see tiny ripples appear. Those ripples scatter radar pulses coming from satellites, making for a fuzzier picture of the ocean. With a bit of math, fuzzy can be translated into windy.

Source: Science News

VANISHING MEGAFAUNA

Rhinos face 'worst poaching'



Africa rhinos face 'worst poaching crisis for decades'

By Mark KinverScience and environment reporter, BBC News

Rhino populations in Africa are facing the "worst poaching crisis for decades," say conservationists.

Over the past three years, gangs are said to have killed more than 800 rhinos for their horns, which can fetch £22,000 per kilo on the black market.

Experts fear the rise in poaching could undermine recent efforts to stabilise black and white rhino populations.

They called for greater co-operation between conservationists and law enforcement agencies.

Source: BBC

IN THE HOT SOUP

Heaviest ever antimatter

PHYSICISTS at the Relativistic Heavy Ion Collider (RHIC) in New York say they have created nuclei of antihelium-4 for the first time the heaviest antimatter particles ever seen on Earth.

Antimatter nuclei are built from antiprotons and antineutrons but of all the various two- and three-quark combinations that can arise in particle collisions, it is rare that multiple antiprotons and antineutrons appear near enough to one another that they bind into anti-nuclei. Although the first antiprotons and antineutrons were discovered in the 1950s, the construction of heavier nuclei has been extremely taxing as each additional anti-nucleon makes the anti-nucleus 1000 times less likely to appear in a particle collision. Up until now, the largest anti-nuclei observed were capped at three anti-nucleons.

But RHIC is an experiment that can generate the right conditions for the formation of antimatter by smashing gold ions together in an effort to simulate conditions shortly after the Big Bang. Two antihelium nuclei seemed to have turned up in this hot soup of particles in 2007, their signatures appearing in collisions recorded by RHIC's STAR detector at an energy of 62 giga-electron-volts (GeV) per nucleon pair. However, as Peter Braun-Munzinger of the GSI Helmholtz Centre for Heavy Ion Research in Germany, who was not involved in this latest research, points out: "If you have something very rare, you would like to measure it twice."

Last year, the STAR collaboration installed an advanced time-of-flight detector that can help to spot unconventional particles among all the debris. The STAR detector, sitting inside a solenoid magnet, enables researchers to determine the masses and charges of new particles by their speeds and deflections in the presence of the magnetic field. From a catalogue of about a billion of collisions at energies of 200 GeV and 62 GeV, a total of 18 revealed themselves as antihelium-4, with masses of 3.73 GeV. The researchers have published their findings on the arXiv preprint server but were unavailable to comment on the work.

250,000 times hotter than the Sun

A 3D rendering of the STAR time projection chamber surrounded by the time-of-flight barrel shown as the outermost cylinder

The rate at which the antihelium-4 was produced at RHIC supports the view that there are two ways to think about how anti-nuclei form. On the system level, the mass of the nucleus is understood in terms of energy and its probability of showing up depends on the system's temperature in RHIC, that's over 250,000 times the temperature of the Sun's core. But, on the level of individual particles, the formation of antihelium-4 relies on the odds that the right nucleons are created in the collision, near enough to one another so that they clump together as a nucleus.

According to the STAR collaboration, the amount of energy needed to add extra nucleons makes it unlikely that larger stable anti-nuclei will be found in the foreseeable future. No known 5-nucleon particle is stable, so experiments will need to jump to something like antilithium-6 nearly a million times less likely to turn up than antihelium-4.

Source: Physicsworld.com

BIOHYBRID CELL

Light-harvesting bacteria

STRUCTURAL studies of some of nature's most efficient light-harvesting systems are lighting the way for new generations of biologically inspired solar cell devices.

Researchers from Washington University in St. Louis and the Department of Energy's Oak Ridge National Laboratory used small-angle neutron scattering to analyze the structure of chlorosomes in green photosynthetic bacteria. Chlorosomes are efficient at collecting sunlight for conversion to energy, even in low-light and extreme environments.

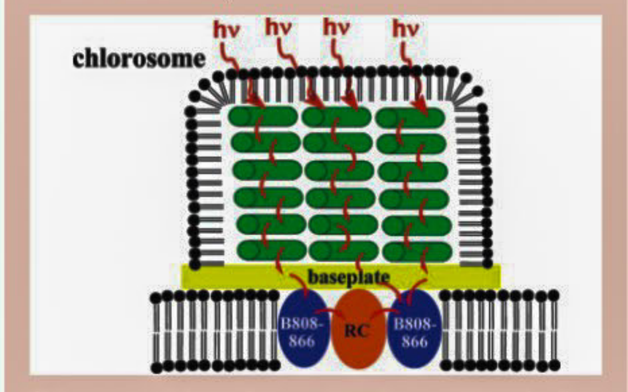
"It's one of the most efficient light harvesting antenna complexes found in nature," said co-author and research scientist Volker Urban of ORNL's Center for Structural Molecular Biology, or CSMB.

Neutron analysis performed at the CSMB's Bio-SANS instrument at the High Flux Isotope Reactor allowed the team to examine chlorosome structure under a range of thermal and ionic conditions.

"We found that their structure changed very little under all these conditions, which shows them to be very stable," Urban said. "This is important for potential biohybrid applications -- if you wanted to use them to harvest light in synthetic materials like a hybrid solar cell, for example."

The size, shape and organization of light-harvesting complexes such as chlorosomes are critical factors in electron transfer to semiconductor electrodes in solar devices. Understanding how chlorosomes function in nature could help scientists mimic the chlorosome's efficiency to create robust biohybrid or bio-inspired solar cells.

Source: Science Daily



Chlorosomes (shown in green) capture and transfer light energy to the reaction center for photosynthesis in bacteria

POET OF COSMOS

Science and Rabindranath

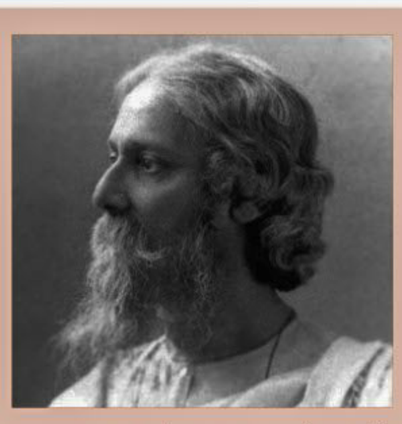
In this column Dr. Ali Asgar's article titled ***"Scientific thoughts of Rabindranath Tagore"*** *will be published in instalments, each having a separate heading- Editor, Science & Live*

DR. ALI ASGAR

Rabindranath was primarily a poet and one of the greatest in the world .He, of course dwelled and flourished in all branches of literature which include short story, novel, drama, essays, songs, critical writing, letters and travel stories. In the later part of his life he turned to painting .It is one of the great mysteries that a single man can achieve so much in so many fields in his finite lifetime.

But to us it seems even more puzzling that Tagore in spite his deep involvement in literature with passionate lyricism and romanticism developed great interest In science with all it's diverse elements and dimensions, its objective rationally and mathematical abstract nature.

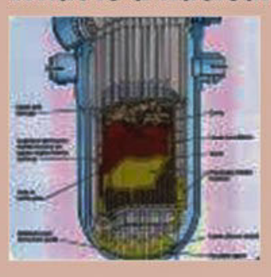
Rabindranath did not have formal education in science in the conventional sense. Although he went to normal school in his childhood, his best exposure to the world of knowledge was through his home teachers. He had an exposure to all the different subjects which included history, geography, literature, mathematics, physical sciences, biology, music, drawings even



gymnastics .It is important to know the early life of Tagore to discover the mystery of his interest in versatile fields and the multidimensional manifestation of his creativity.

DID YOU KNOW?

What is a nuclear meltdown?



A nuclear meltdown is an informal term for a severe nuclear reactor accident that results in core damage from overheating. The term is not officially defined by the International Atomic Energy Agency or by the U.S. Nuclear Regulatory Commission. However, it has been defined to mean the accidental melting of the core of a nuclear reactor, and is in common usage a reference to the core's either complete or partial collapse. "Core melt accident" and "partial core melt" are the analogous technical terms. For a technical overview, see the behavior of nuclear fuel during a reactor accident.