Electricity from brown liquor and solar cells

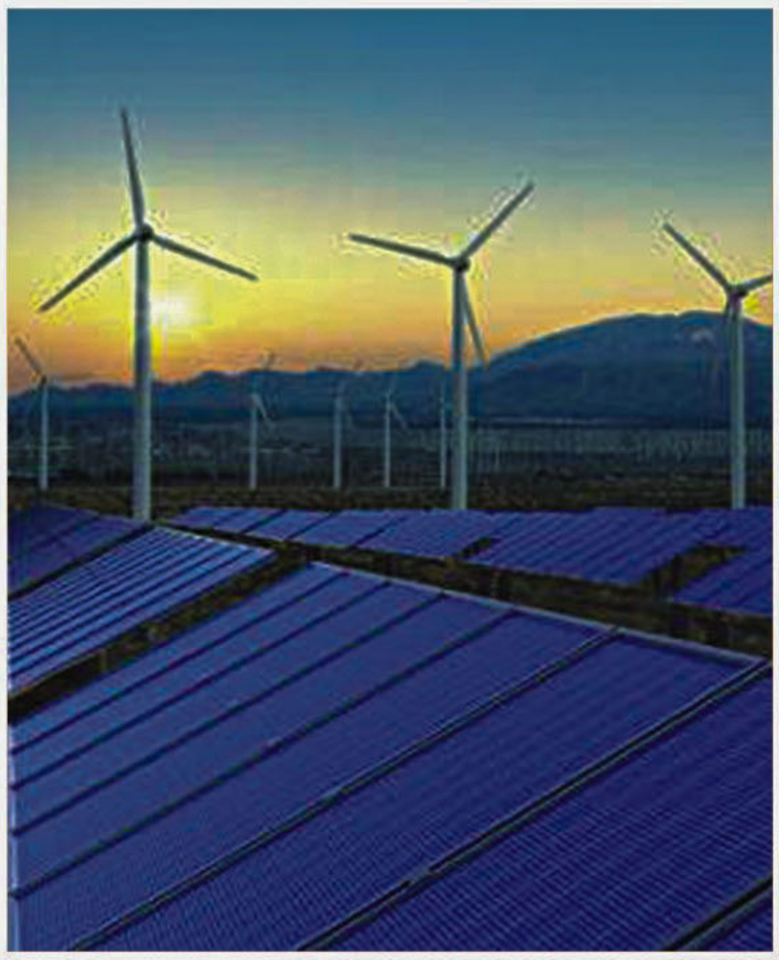
A breakthrough for inexpensive electricity from solar cells, and a massive investment in wind power, will mean a need to store energy in an intelligent way. According to research at Linköping University, published in Science, batteries of biological waste products from pulp mills could provide the solution.

Organic solar cells based on conductive plastic is a low cost alternative that has achieved high enough performance to be upscaled and, in turn, become competitive. However, solar electricity must be able to be stored from day to night, as well as electricity from wind turbines from windy to calm days.

In conventional batteries metal oxides conduct the charge. Materials, such as cobalt, are expensive and a limited resource, therefore, low cost solutions are sought preferably with renewable materials.

"Nature solved the problem long ago," says Olle Inganäs, professor of biomolecular and organic electronics at Linköping University (LiU) and lead author of the article in a recent edition of Science.

He drew inspiration from the process of photosynthesis, where electrons charged by solar energy are transported by quinones; electrochemically active molecules based on benzene rings composed of six carbon atoms. Inganäs chose the raw material brown liquor that is a by-product from the manufacture of paper pulp. The brown liquor is largely composed of lignin, a biological polymer in the plant cell walls.



Solar panels and wind turbines. A breakthrough for inexpensive electricity from solar cells, and a massive investment in wind power, will mean a need to store energy in an intelligent way.

To utilise the quinones as charge carriers in batteries, Inganäs and his Polish colleague Grzegorz Milczarek devised a thin film from a mixture of pyrrole and lignin derivatives from the brown liquor. The film, 0.5 microns in thickness, is used as a cathode in the battery.

The goal is to offer ways to store renewable electricity where it is produced, without constructing up large grids. In several countries, major wind power investments are planned. Meanwhile, the performance of cheap organic solar cells has now reached a critical level. A research team at the University of California, Los Angeles, has recently reported efficiency of more than 10 percent of the energy of the captured sunlight.

According to Inganäs who for many years conducted research on organic solar cells, the efficiency is sufficient to initiate an industrial scale up of the technology.

"Now we need more research into new energy storage based on cheap and renewable raw materials. Lignin constitutes 20-30 percent of the biomass of a tree, so it's a source that never ends.

Source: Science Daily

Cute baby white rhino with its mama.

Zoo diet lowers rhino birth?

ZOOS may be welcoming fewer baby rhinos into the world in the future: Their reproductive rates are dropping drastically because of medical problems. New research suggests their zoo diet could be playing a role in the drop in babies and increase in disease.

The zoo diet contains relatively high levels of estrogenlike compounds from plants (called phytoestrogens), which might be contributing to reproductive failure in the females, according to the new study published in the April issue of the journal Endocrinology.

"Understanding why the captive white rhinoceros population has been dwindling for decades is an important part of protecting the future of this species," study researcher Christopher Tubbs, a scientist with the San Diego Zoo Institute for Conservation Research, said in a statement. "Our work is the first step toward determining if phytoestrogens are involved in this phenomenon and whether we need to reevaluate captive white rhino diets."

Other theories have been put forth to explain reproductive problems in females raised in captivity, including the female rhinos' constant close proximity to potential mates (rather than meet-ups for breeding) and suppression of their fertility from living alongside other females; however, these don't hold up, said Heather Patisaul, an assistant professor from North Carolina State University who wasn't involved in the research.

Source : Live Science

BRIDGING THE GAP

From lab to village

Life-saving interventions like bed nets need to be disseminated widely and at low cost.

IMPROVING health for the poor depends on nurturing local innovations and learning how to deliver them, argue Abdallah Daar and Peter Singer.

In the 1980s and 1990s the world's life sciences researchers were largely ignoring the poor, with genomics, for example, mostly confined to sophisticated labs in the rich world.

We argue that the life sciences revolution is now ushering in a new era of better and less expensive drugs, vaccines and diagnostics. [1] The prospect of improving health is greatest in low- and middle-income countries (LMICs), and the hope is that a child born in a poor country will have the same life expectancy as a child born in a rich country.

We are already seeing these efforts bear fruit. Take malaria, for example: a vaccine is due to be deployed by 2016. And at a biological level, researchers are studying genetic profiles to understand why some children get cerebral malaria and die while others don't. This is just one of many applications of life sciences in global health.

But there are ethical, social and commercial challenges in taking life-saving science from the lab to the village to those most in need of these innovations. The sustainable solutions to these obstacles are homegrown, where the lab is closest to the village.

The Bill & Melinda Gates Foundation's Grand Challenges in Global Health programme, launched in 2003, began with 14 'critical barriers' to solving (mainly infectious) health problems in the developing world.

Subsequent initiatives for research prioritisation have focused on non-communicable diseases, such as the Grand Challenges in Chronic Non-Communicable Diseases, which led to the creation of the Global Alliance for Chronic Disease (GACD) an international alliance of funding bodies to coordinate research on heart disease and stroke, some cancers, respiratory conditions and type 2 diabetes and more recently the Grand Challenges in Global Mental Health initiative.

Source: Scidev.net

GOLDILOCKS ZONE

Habitable zone around a star

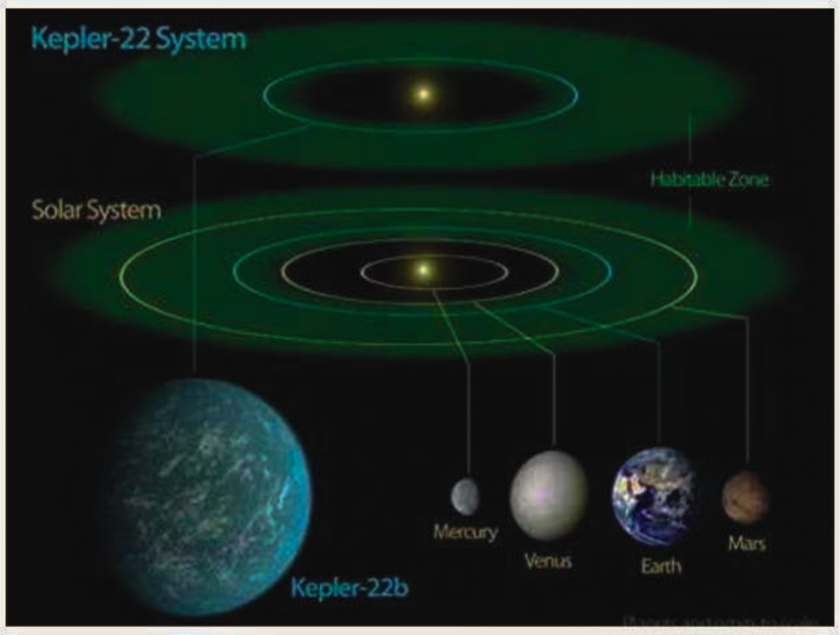
OBAIDUR RAHMAN

WE often hear about astronomers discovering a new planet within the goldilocks zone. But what is this goldilocks zone (GZ) and why is any news of sighting a planet within the vicinity of GZ interesting? In astronomy, goldilocks zone, is also known as the habitable around a star where a planet or several planets with enough atmospheric pressure are able to maintain liquid water on their surface without the water neither being completely vaporized or frozen. And the existence of liquid water signals the presence of life.

One good example of a planet located in such goldilocks zone is our 4.5 billion year old Earth. The distance from our Sun to the Earth that we live on is just right where water is neither too cold (like Mars) nor too hot (like Venus) and thus the planetary atmospheric and environmental condition is just perfect to sustain carbon-based life forms, which eventually evolved into intelligent life. Scientists also argue that it doesn't necessary have to be a carbon based life form, some astronomers are suggesting that there might be ammonia and methane based life forms on other parts of the Universe. It is important to note that the Eart's almost circular orbit keeps it firmly within the GZ at all time, but if a planet orbits covering much wider distance going into and out of the goldilocks zone during the course of orbiting, then it is incapable of supporting life. It is in the goldilocks zone where other Earth-like planets could be found with the great possibility of an intelligent alien life form in other solar systems.

So far quite a few planets have been discovered that are thought to exist, at one time or another, within the vicinity of GZ. Some of these include, Gliese 581 C & D, moons of 16 Cygni Bb, moons of the gas giants Gliese 876 b & c, watery clouds and moons of Upsilon Andromedae d, satellites of another gas giant HD 28185 b, moons of a Jupiter-like gas giant 55 Cancri f, the planet HD 85512 b, which is one of the best candidates to host alien life, Kepler-22b which is a super Earth planet meaning it is 2.4 times the size of Earth, GJ 667Cc which is also a gas giant that is believe to be in GZ.

Besides these a host of planets were discovered by Kepler Space Observatory Mission Team. Amongst them 54 are thought to exist in the goldilocks zone. According to scientists, within a 1000 light years of Earth, there ought to be at least 30,000 habitable worlds. Given that there are at lease 50 billion planets in the Milky Way alone, there should be at least 500 million in the goldilocks zone.



The Goldilocks region is an area of space in which a planet is just the right distance from its home star so that its surface is neither too hot nor too cold.

Gnome tests weird gravity

THERE aren't too many gardens at the South Pole. But there are, apparently, garden gnomes. A globe-trotting little garden gnome dubbed "Kern" recently visited Amundsen-Scott Research Station at the geographic South Pole in Antarctica. The inanimate traveler's trip was a take on the "Traveling Gnome Prank," a joke that's been in vogue since the 1980s, when pranksters started stealing garden gnomes and sending photographs of the statuettes in front of famous sightseeing spots to their owners.

Kern's travels have a scientific bent, however. The precision scale company Kern & Sohn is teaming up with schools and research stations worldwide to highlight the variations of gravity across the globe.

"Most people don't realize Earth's gravity actually varies slightly," Tommy Fimpel, one of the experiment's coordinators, explained in a statement. "One of the main causes is variations in the shape of the planet. Believe it or not, the Earth is actually slightly potato-shaped, so you'll weigh up to 0.5 percent more or less, depending on where you go."

Even glaciers can change an area's gravity; a mysterious dip in gravity over Canada is likely the result of now-melted glaciers that left behind an imprint from which Earth is still rebounding.

"We thought our Gnome Experiment would be a fun way to measure the phenomenon," Fimpel said.

So far, Kern has traveled, via the mail, to places as far-flung as Lima, Mumbai, Mexico, South Africa, San Francisco, New Caledonia, Sydney and the South Pole. [Photos of Globe-Trotting Gnome]

At the South Pole, where Kern landed last month, the gnome tipped the scale at 309.82 grams, his heaviest measurement yet. That's because the inertia produced by Earth's rotation is stronger at the poles, said Marie McLane, a researcher with the United States Antarctic program and Kern's "host" on the visit to Antarctica. Earth is also slightly squished in shape, with a bulge at the equator, so the planet is less thick at the poles, also contributing to a stronger gravitational effect.

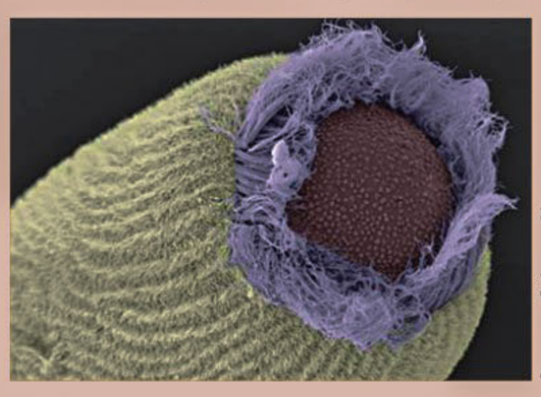
Kern jetted off to Japan after hitting Antarctica, weighing in at 307.9 grams in Tokyo. His next stop is at Snolab in Canada, an underground research station 1.2 miles (2 kilometers) below the Earth's surface. From there, Kern will visit the Large Hadron Collider, the world's largest particle accelerator, at CERN near Geneva.

Kern's journey to Antarctica didn't only highlight the gravitational vagaries of Earth; it also shed light on the planet's elusive garden gnome population. The gnome's visit inspired McLane to do some detective work around the Amundsen-Scott Research Station. She found five little gnomes already lurking in labs and other spots around the station including one, fittingly enough, guarding a greenhouse.

Source: Live Science

SPONGY LOOK

Gene might help sponges see



Source: Science News

In the eye cells of Amphimedon queenslandica larvae, a gene called cry2 is turned on.

Some larval sponges search for a shady place to settle down, but they don't have optic nerves or the genes that are important for vision in most animals. Now biologists have new insight into how sponges might see light.

Larvae of the sponge Amphimedon queenslandica have unique eyes made up of cells that contain pigment, a chemical that absorbs certain wavelengths of light, and cilia, which look like tiny hairs. Right next to these pigmented cells are cells with high levels of activated cry2, a gene that makes light-sensitive proteins, Todd Oakley of the University of California, Santa Barbara and others report in the April 15 Journal of Experimental Biology.

DID YOU KNOW?

Which bird mimics best?

Although parrots can be trained to say about 200 words and short phrases, as a species, they are not the best of the bird mimics. In fact, the top word mimic is actually the Mynah bird. Its ability to create amazingly realistic human and non human sounds such as words, coughs, sneezes and even cell phone ring tones is well documented.

Other birds that are extremely intelligent and known to mimic human words are crows, ravens and jackdaws. Although their abilities are less publicized.

Here, the gnome is standing at the Antarctic South Pole. Turns out, the gnome (and you) weighs more at the South Pole than at the equator.