Green agriculture with plastic

DR KSHIRODE C ROY

PLASTIC is usually considered to be a big threat to the environment as it is not usually degradable. But a lot of improvement has been made in recent years in the plastic sector and its use in agriculture is increasing very rapidly throughout the world. Bangladesh is no exception in this regard. Its use in agriculture, called plasticulture, in the form of polyvinyl chloride (PVC) pipes for deep tubewell (DTW) and shallow tubewell (STW), buried pipe for underground water distribution system for irrigation, flexible PVC pipes for conveyance of water of STWs and DTWs, and polybags for raising seedlings became very common in Bangladesh. In protected agriculture, vegetables and small fruit are grown giving some kind of protection from adverse weather like rainfall, temperature, wind, diseases, insects, water logging, etc. all of which seriously affect crop yield. In this system, crops are shaded by plastic sheets put on top of structure made of bamboo or galvanized iron pipes. Summer tomato is grown commercially in this system. All these uses have made agricultural operations easier and cost effective.

The first use of plastics in agriculture was in 1948 to make cheaper version of glasshouse. By 1999 almost 12 million hectares worldwide were covered in plastic mulch. The majority of the growth of plasticulture has happened in China, Japan and Korea. In Middle East and Africa, areas are increasing at 15-20 per cent per year compared to 30 per cent in China. In southern Spain around Almeria, the driest area of Europe, plasticulture is growing very rapidly to grow different crops. The area, previously non-cultivable due to shortage of water, became green due to plasticulture.

Technologies developed for other uses of plastics are:

Drip irrigation: In research fields, drip irrigation

method has been used in Bangladesh for increasing the water and fertilizer use efficiencies of high value crops like aubergine, papaya, banana, guava, lemon, orange, etc., for more than a decade. It is a technically suitable and economically viable technology. It saves 60 per cent urea and 46 per cent water. Tubes, drippers and water tanks for drip irrigation are made of plastics.

Row covers: For vegetable production, row covers are used as a protective covering to shield plants primarily from the undesirable effects of cold and wind, and also from insect damage. Polyethylene and polypropylene are commonly used, which are very lightweight, often placed on wire loops to form low tunnels. It is left in place for several weeks until crops are well established. Sunlight, rain and air can penetrate through the shading material.

High tunnels: It is a tunnel made of polyethylene and iron or bamboo structure, usually semicircular, square or elongated in shape. Its height is lower than greenhouse and higher than row covers. The interior heats up because incoming solar radiation from the sun warms plants, soil and others inside the tunnel faster than heat can escape. This heating aspect made high tunnels popular in temperate region. In Bangladesh, India and many Asian countries, it is used to grow tomato during rainy season.

Plastic mulches: It is used in similar fashion to other mulches, to reduce evaporation from soil surface and to suppress weeds and insects. Besides, use of drip irrigation in conjunction with plastic mulch allows one to reduce leaching of fertilizers. It keeps ripening fruit and vegetables out of soil that ultimately decreases rotting and keeps them clean. Also it reduces soil compaction and root damage, increases crop yield, and ensures early harvest.

More uses of plasticulture are waiting for Bangladesh. Research and pilot-scale study have recently been started on new types of use.

The writer is former DG, BARI

DEATH SPIRAL

Corals send chemical SOS

WHEN a killer seaweed touches a kind of spiky coral, the coral pushes a chemical panic button that brings small resident fish to the rescue.

Unchecked, seaweed algae can overrun a coral reef, as the community dwindles in "a descent into slime," says marine ecologist Mark Hay of the Georgia Institute of Technology in Atlanta. But within 15 minutes of contact with a toxin-making seaweed, an Acropora nasuta coral releases compounds that prompt goby fish to seek out and trim back the seaweed, Hay and colleague Danielle Dixson report in the Nov. 9 Science.

"We've lost about 80 percent of the living coral in the Caribbean and 50 percent in the western Pacific," says coral biologist Nancy Knowlton of the Smithsonian Institution in Washington, D.C. "So a better understanding of what keeps corals healthy is essential."

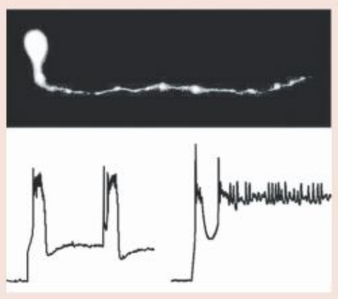
In reefs, corals and the seaweed algae that form lawns or shrubby thickets compete for light and space. As coral reefs decline from pollution, overfishing, climate change and other insults, biologists have seen swaths of seaweed take over. Lush seaweed intrusions repel or smother larval corals, accelerating what Hay calls the reef "death spiral."

Source: **Science News**

True color (left) and sea surface temperature (right) showing slight discoloration and cooler temperatures typical of a river plume from the Hudson River.

AUTORHYTHM

Deep into spinal nerve



Micrograph of a fluorescently labelled IC cell of the zebrafish embryo spinal cord.

SCIENTISTS from the University of Leicester have hit upon unique forms of spinal nerve activity that shape output of nerve cell networks controlling motor behaviours.

The breakthrough in the Department of Biology at the University of Leicester was announced Nov 8 in the journal Current Biology.

Although the neural basis of motor control has been studied for over a century, the processes controlling maturation of locomotor behaviours -- like walking and swimming -- are not fully understood.

The University of Leicester research into nerve cells responsible for motor behaviours was carried out on fish. The team aimed to understand how spinal networks produce rhythmic activity from a very immature stage -- and how such activity changes during maturation.

The team used zebrafish, a freshwater fish native to northern India and Bangladesh, because their motor networks are similar to humans. However, as they are fertilized outside the mother and their embryos are transparent, scientists can readily monitor motor network development from its onset -- something that is very difficult to do in mammals.

Lecturer in Neurobiology, Dr Jonathan McDearmid, who led the research, said: "What's unique about our work is the observation that a group of spinal nerve cells generate unusual forms of electrical activity that adapt to meet the changing requirements of the developing motor network.

Source: **Science Daily**

ENTANGLED,TWIST

Entanglement gets extra twist

QUANTUM physics is the science of the very small. But physicists are making it bigger, setting records for the size and energies of objects they can get to exhibit quantum effects.

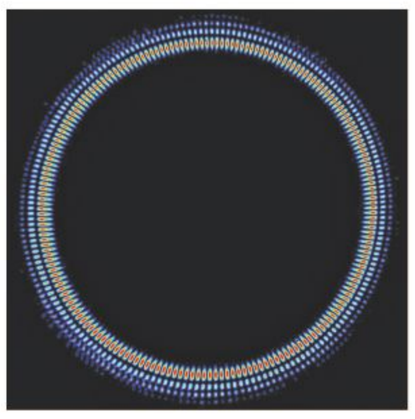
Now physicists at the University of Vienna in Austria have "virtually intertwined" or entangled two particles spinning faster than ever in opposite directions. Entanglement occurs when two particles remain connected so that actions performed on one affect the other, despite the distance between them. (Einstein referred to this eerie connection as "spooky action at a distance.")

In the new study, Anton Fickler and his colleagues entangled two photons that had a high orbital angular momentum, a property that measures the twisting of a wave of light. In quantum physics, particles such as photons can behave as particles and waves.

"It's a stepping stone on the development of new technologies," said Anton Zeilinger, director of the Institute for Quantum Optics and Quantum Information and a co-author of the study, which is detailed in the Nov. 5 issue of the journal Science.

Such entanglement experiments have been carried out for decades. In this case, though, the researchers did something a bit different. They created entangled photons and gave them lots of angular momentum, more than in any experiment before.

Usually the energy contained in a photon is very small: its quantum



A false-color image of a laser beam showing a superposition of entangled photons.

number is low. At higher energies, this changes. Quantum physics and "normal" or classical physics start to look similar when quantum numbers get high; this is called the correspondence principle, and it applies to many areas of physics.

To create entangled photons, Fickler and his team sent a laser through a beam splitter, dividing the laser beam into two. Two photons were sent down separate optical fibers and their waves were twisted, and twisted, and twisted some more, ramping up their angular momentum imagine a wave shaped like a spiral, spinning faster and faster. [Twisted Physics: 7 Mind-Blowing Findings]

Eventually, there was enough angular momentum in the photons that their quantum numbers the units their momentum is measured in differed by a factor of 600, a higher value than any seen previously. The photons spinning rapidly in opposite directions, meanwhile, were still entangled.

They knew this because when particles are entangled, measuring the quantum state (in this case the angular momentum and orientation) of one particle immediately tells you the quantum state of the other, no matter where it is. Since they had the ability to measure both the researchers could confirm entanglement.

(Though this transfer of information between the particles is instantaneous, entanglement can't be used for faster-than-light communication because it is impossible to set the quantum state beforehand, as you would in a message).

This shows that entanglement effects can be seen at high energies, meaning closer to the macroscopic world we all know and interact with. "It means we have to take the correspondence principle with a large grain of salt," Zeilinger said.

Just as importantly, the experiment shows that the only barrier to applying certain kinds of quantum effects ins technical there is no physical reason that one shouldn't be able to see quantum phenomena at high enough energies that they would bleed into the visible world, though that will take some time to do.

Source: **Live Science**

El Niño may say adios

ADIOS, El Niño. Forecasters have called off predictions for a wet winter in the West, finally acceding that ocean temperatures in the Pacific show no signs of the infamous El Niño phenomenon.

Weather experts at the Climate Prediction Center (CPC) first warned of developing El Niño conditions in June. An El Niño is the warming of the equatorial Pacific Ocean, which results in major droughts in Southeast Asia and wet winters for the southwestern United States. In a boon for the battered Northeast, an El Niño would have meant less wintry weather there.

But in the following months, sea-surface temperatures failed to warm enough to shift global weather patterns. In early October, the CPC dropped the odds of an El Niño from 70 percent to 55 percent.

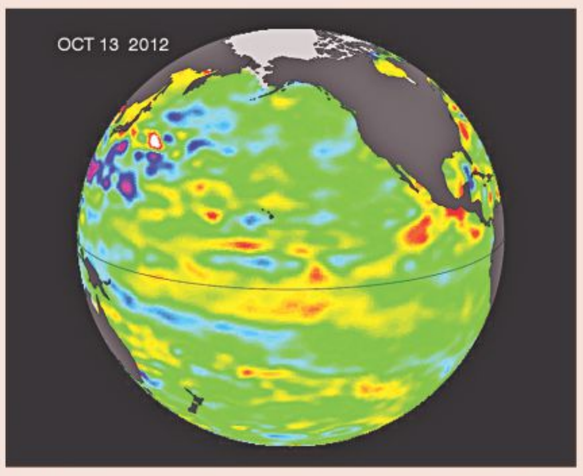
Finally, the CPC, part of the National Oceanic and Atmospheric Administration (NOAA), called off the El Niño forecast Thursday (Nov. 9). "The previous El Niño watch has been discontinued as the chance of El Niño has decreased," the CPC said yesterday in its monthly report.

While the chances of El Niño seem nil, the CPC said tropical ocean temperatures may still remain above average.

Instead of El Niño, NOAA predicts that the neutral phase of the El Niño/ La Niña Southern Oscillation (ENSO) index will prevail. Jokingly called "La Nada," it is the neutral middle ground between El Niño and La Niña (associated with cool water in the equatorial Pacific).

El Niño expert Bill Patzert first pegged the La Nada back in June. "The equatorial Pacific is neutral, with no El Niño developing... not even a hint," said Patzert, of the Jet Propulsion Laboratory in Pasadena, Calif., in June. Even as ocean temperatures warmed slightly, Patzert said he maintained the call.

Source: **Live Science**



This image depicts places where the Pacific sea surface height is higher than normal.

SPLIT EMPIRE

New emperor penguin colonies

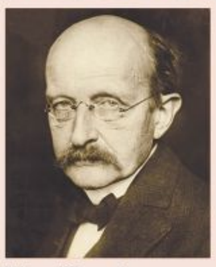
Source: **Live Science**

Researchers have finally found a long-sought colony of emperor penguins in eastern Antarctica, but they say it's been split in two due to a glacier break. Moreover, a tally of the 6,000 chicks among these two populations suggests there are more emperor penguin parents in this part of the frozen continent than previously thought.

French scientists spied the waddling, flightless birds on winter sea ice near the Mertz Glacier while on their way to Dumont d'Urville Station. (The documentary "March of the Penguins" was filmed near this research base.)

DID YOU KNOW?

What is planck's constant?



Max Planck

Planck's constant, (symbol h), fundamental physical constant characteristic of the mathematical formulations of quantum mechanics, which describes the behaviour of particles and waves on the atomic scale, including the particle aspect of light.

The German physicist Max Planck introduced the constant in 1900 in his accurate formulation of the distribution of the radiation emitted by ablackbody, or perfect absorber of radiant energy. The significance of Planck's constant in this context is that radiation, such as light, is emitted, transmitted, and absorbed in discrete energy packets, or quanta, determined by the frequency of the radiation and the value of Planck's constant.

Source: **Encyclopedia Britanica**