The Daily Star

SCIENCE & LIFE

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FUEL FROM FLOWER

Sunny side of sunflower

A $10.5 million research project aimed at mapping the DNA sequence of sunflowers could one day yield a towering new variety for both food and fuel.

Researchers envision crossbreeding a standard sunflower with the Silverleaf species out of Texas to produce a hybrid with bright yellow flowers bursting with tasty seeds and thick stalks filled with complex sugars that can be turned into ethanol.

The wild, drought-resistant Silverleaf is known for its woody stalks, which can grow up 15 feet tall and 4 inches in diameter.

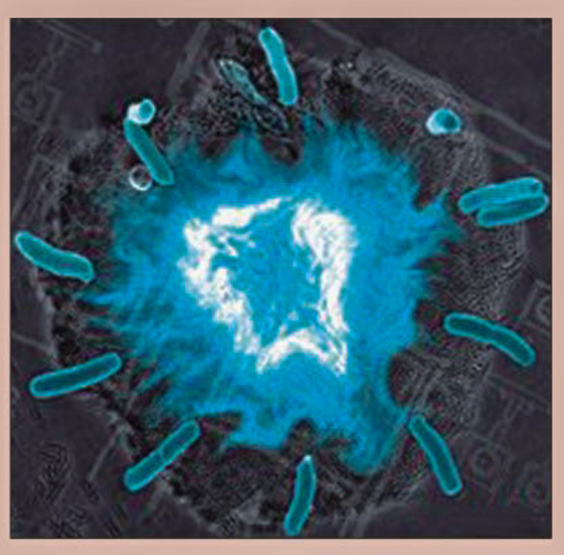
"Since it's the closest relative of the cultivated sunflower, it should be perhaps reasonably straightforward to move some of the traits," said Loren Rieseberg, a University of British Columbia botany professor and leader of the DNA sequencing project.

The Genomics of Sunflower project is funded by Genome Canada through the Canadian government, Genome BC, the U.S. Energy and Agriculture departments and France's National Institute for Agricultural Research.

Its goal is to locate genes responsible for agriculturally important traits such as seed oil content, flowering, drought and pest tolerance. Participants plan to map the genome for the greater sunflower family, known in the science world as Compositae and including more than 24,000 species of sunflowers, lettuce, artichokes, daisies, ragweed, dandelions and other plants.

Scientists hope that within four years, they'll be able to develop a basis for a breeding program in which understanding of the plants' genes dramatically reduces the time it takes to develop hybrids.

Source: AP



Bacterial cells engineered to produce fluorescence

Synthetic biology

Scientists have produced a very unusual light show, engineering bacterial cells to fluoresce in synchrony.

The researchers turned the cells into synchronised "genetic clocks" - programming them to switch a fluorescent protein on and off.

These waves of activity could eventually be used to make biological sensors, or to programme cells to release timed doses of medicine.

The researchers report the advance in the journal Nature.

Synchronised waves, or oscillations, are important to scientists because they control crucial functions in the human body, such as the sleep-wake cycle, learning processes and the regular release of substances including insulin.

This same team of researchers, which was led by Dr Jeff Hasty from the University of California San Diego, US, first produced "flashing" cells a year ago. These bacterial clocks could be tuned to alter the rate at which they blinked on and off.

But this latest advance allows the cells "talk to each other" and synchronise their activity as they grow into a colony.

Source: BBC

SCIENCE QUIZ

Quiz 1
Who was the first scientist to win Nobel Prize twice?

Quiz 2
How do we commonly know a class of edible crystalline substances, mainly sucrose, lactose, and fructose?

Answers to last Quiz
Quiz 1: c
Quiz 2: a

ERA OF MICRO-MACHINES

Factory on a kitchen cabinet

DR. SANWAR ALI

NOBEL Laureate physicist Richard Feynman gave a visionary lecture entitled "There's Plenty of Room at the Bottom" at Caltech in December 1959. He said, "…. our ability to see what we are doing, and to do things on atomic level, is ultimately developed --- a development which I think cannot be avoided." He asked, "Why cannot we write the entire 24 volumes of the Encyclopaedia of Britannica on the head of pin?" What he was talking about is nanotechnology.

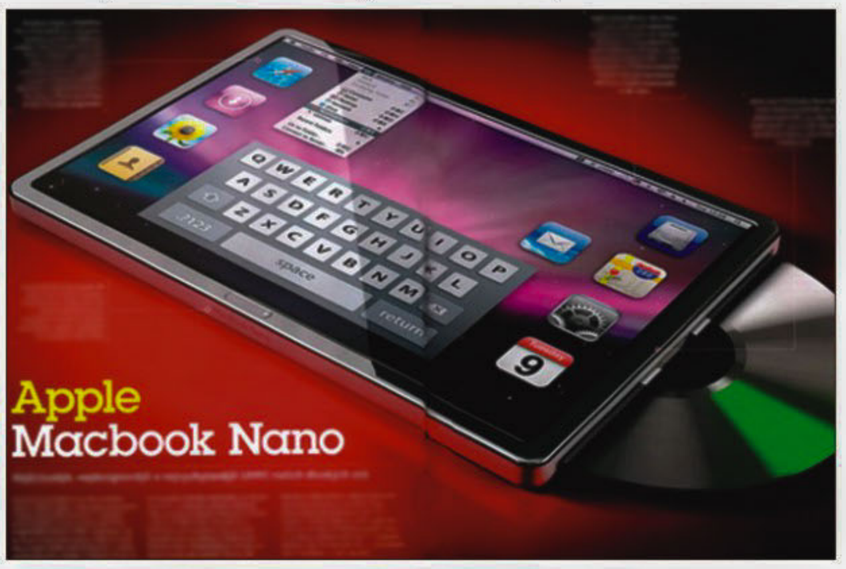
In 1986 Eric Drexler brought the term nanotechnology to public attention by writing an extraordinary book "Engine of Creation". In his book he gave the idea of universal assemblers that form the basis of molecular manufacturing. He writes, "Now imagine something like that factory, but a million times smaller and working a million times faster, with parts and workplaces of molecular size." Drexler says, "Nanotechnology isn't primarily about miniaturizing machines, but about extending precise control of molecular structures to larger and larger scales. Nanotechnology is about making precise things big."

Many researchers believe that nanotechnology will soon provide humans the ability to move and combine individual atoms and molecules into microscopically tiny mechanical, electrical, and biological machines that will replace today's production process and tools.

Computers based on nanotechnology will be smaller and more powerful than ever. Even without computers, nanotechnology will incorporate a kind of intelligence into materials that will react to and influence their environment in complex and predictable ways, much like biological organisms. For example, nanoscale robots (or nanobots) will be able to operate autonomously to inspect, mend, or destroy targeted substances. Biological nanobots will do the same operating on DNA instructions. Both types of nanobots will be able to replicate themselves

Molecular nanotechnology is about constructing shapes, machines, and products at the atomic level putting them together molecules-by-molecules. With parts only a few nanometers wide, it may become possible to build a supercomputer smaller than a grain of sand, weapon smaller than a mosquito, or a self-contained nanofactory that sits on our kitchen counter.

Microprocessors and related gear



will not only get smaller and more powerful (for example terabits of storage will fit into devices the size of a wristwatch), but they will also become far less expensive to manufacture. In 10 years or so, nanotechnology will begin to appear in sensors and other types of chips, but it will be used to enhance, rather than replace, semiconductors made of silicon. Nanotechnology may be used to make chemical leak detectors or serve as the cache memory on a microprocessor.

Even with current established technology, computer processing power is growing at extraordinary rates. Current state-of-the-art microprocessors have more than 40 million transistors. By 2015 they will be increased nearly five billion. This trend will demand a new type of computing machine, known as the nanocomputer, based on nanotechnology. Quantum computing using nanocomputer will increase the power of computers billions of times over what they are now, allowing the development rate of nanoreplicators and assemblers to explode.

The future will increasingly be shaped by autonomous, intelligent systems that can access and analyze great amounts of information.

Industry leaders believe in 10 to 15 years, the global market for nanotech products will exceed $1 trillion annually. In 2004 United States federal investment in nanotechnology was about $1 billion, more than any other country including the entire European Union. However, Japan, China, and Europe spent $900 million each, with growth rates comparable to U.S. increases. The U.S. spending in nanotechnology is boosted by unparalleled private investment, accounting for nearly half of the $4 billion spent by corporations and venture capital globally.

The writer is a physicist and computer scientist. Currently he teaches at the Indiana University of Pennsylvania, USA.

SAVING THE TIGER

Big cat in crisis

Adult male tigers at Wat Pa Luangta Bua Yannasampanno Forest Monastery in Kanchanaburi, Thailand

After trudging through the wilds of western Thailand for several hours, the forest rangers thought they were finally onto something: the distant sound of crunching leaves.

Automatic weapons drawn, the five Thais crept forward, hoping to catch a tiger poacher. It turned out to be a banteng, a wild cow, which disappeared into the woods.

But all in all, the absence of illegal hunters was good news, said ranger Sakchai Tessri. "When we passed before, we would always run into poachers." Now he felt their room for maneuver was narrowing.

"In the old days," he said, "they would spend many nights in the forest for poaching. Now they just come in, shoot, grab and go quickly."

The 6,400-square-kilometer (2,500-square-mile) Huai Kha Kheang and Thung Yai Wildlife Sanctuaries on the Myanmar border represent a rare success in the struggle to save the world's dwindling tiger population.

Funded by the New York-based Wildlife Conservation Society, the increased patrols, armed with the latest technology, have scared off poachers and helped stabilize the tiger population of more than 100, along with animals such as the banteng which they prey on.

Elsewhere, tigers are in critical decline because of human encroachment, the loss of more than nine-tenths of their habitat and the growing trade in tiger skins and body parts. From an estimated 100,000 at the beginning of the 20th century, the number today ranges between 3,200 to 3,600, most of them in Asia and Russia.

Now hopes are rising that 2010 will see a turning point.

Ministers from the 13 countries with tiger populations will hold a first-ever meeting Wednesday through Friday in Hua Hin, Thailand to write an action plan for a tiger summit in September in Russia, where Prime Minister Vladimir Putin has been championing the survival of the tiger.

The purpose of this week's meeting is to elicit promises of more money for conservation and to persuade countries to set tiger population targets. It is being organized by the Global Tiger Initiative, a coalition formed in 2008 by the World Bank, the Smithsonian Institute and nearly 40 conservation groups. It aims to double tiger numbers by 2020

Source: AP

LAKE OF HOPE

LAKE BAIKAL

World's deepest freshwater lake

Lake Baikal

ZAHANGIR KABIR

LAKE Baikal, the deepest in the WorldLake Baikal, lake in southern Siberian Russia, the deepest lake in the world with a maximum depth of 1,637 m . It is estimated to contain approximately one-fifth of all the earth's fresh surface water. The lake has an area of 31,500 sq km and about 1,963 km of shoreline, making it the third largest lake in Asia, as well as the continent's largest freshwater lake in terms of surface area. The crescent-shaped lake is 636 km long and varies in width from about 14 to 80 km . The lake is fed by the Selenge, Barguzin, and Verkhnaya Angara rivers and by more than 300 mountain streams. The only outlet is the lower Angara, which flows west from the lake into the Yenisey River. The Baikal, Barguzin, and other mountain ranges surround the lake, rising on all shores except the southeastern Selenge delta. Lake Baikal has several islands, the largest of which is Olkhon. Nizhneangarsk and Listvyanka are ports on the lake.

Baikal is known for the remarkable clarity of its waters and for the great diversity of its plant and animal life. The majority of species found in the lake are widespread. The sturgeon, salmon, and freshwater-seal fisheries of the lake are valuable, and large quantities of other fish are also caught. Petroleum wells and mineral and hot springs are found in the vicinity. The southern shores of the lake are inhabited by the Buryats, who are closely related to the Mongols of neighboring Mongolia .The Russian discovery of Lake Baikal in 1643 provided an important link in the trade route between Russia and China, connecting Listvyanka with points east to the Mongolian frontier via the Selenge River and tributaries. In the 1950s and 1960s, much of the unique plant and animal life in Baikal was adversely affected when refuse from a Soviet pulp- and papermaking complex on the southern shore was deposited in the lake. During the 1970s efforts were made to curtail pollution and clean the lake's waters. A ban on fishing, imposed from 1969 to 1977, restored the stocks of many species.

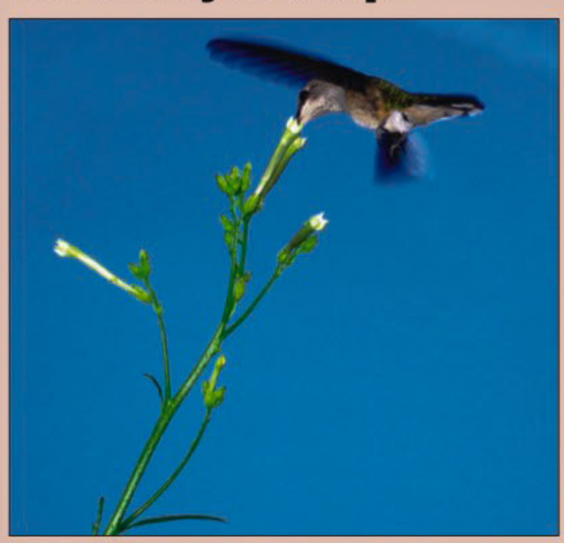
Lake Baikal is the deepest freshwater lake in the world and the third largest lake in Asia.

The writer teaches English at Shanto-Mariam University of Creative Technology, Uttara, Dhaka.

Location of the great lake

TRICKY NATURE

Novel way to adapt



A black-chinned hummingbird visits a Nicotiana attenuata flower

The tobacco plant Nicotiana attenuata has a love-hate relationship with the hawkmoths that visit its flowers every night. The moths pollinate the plant, but they also drop off eggs that hatch into very hungry caterpillars. Now ecologists have found that when a tobacco plant is being clobbered by caterpillars, it shifts the time of day its flowers open. That makes it more appealing to hummingbirds, a more benign pollinator that doesn't eat leaves.

Ecologist Danny Kessler noticed the change in flowering time in 2008. He works at the Max Planck Institute for Chemical Ecology in Jena, Germany, but does his field studies in Utah, where the plant, a wild relative of cultivated tobacco, grows. That summer, he was trying to get a picture of the plant being pollinated for a study that was about to come out in Science--one good enough for the cover of the journal. "I noticed that the flowers really looked different in the morning." And there were a lot more of them. N. attenuata normally flowers at dusk and leaves its flowers open until 9:00 or so the next morning, but these plants were opening new flowers in the morning. "That's not supposed to happen," says Kessler's colleague Ian Baldwin, an ecologist at the same institute.

Source: ScienceNow