

SCIENCE & LIFE

DHAKA TUESDAY DECEMBER 14, 2010, E-MAIL: science&life@thedailystar.net

Swarm intelligence in plants

They're underfoot and underappreciated. But the roots of a plant may demonstrate the remarkable wisdom of crowds just as swarms of honeybees or humans can.

Three plant scientists now propose that roots growing this way and that in their dark and dangerous soil world may fit a definition for what's called swarm intelligence. Each tip in a root system acquires information at least partly independently, says plant cell biologist František Baluška of the University of Bonn in Germany. If that information gets processed in interactions with other roots and the whole tangle then solves what might be considered a cognitive problem in a way that a lone root couldn't, he says, then that would be swarm intelligence.

The decisions that emerge from groups of individuals have intrigued a wide range of researchers, for in some cases crowds show an eerie wisdom. Honeybees looking for a new home can collectively pick excellent nest sites even as individual scouts advocate for a variety of choices. And combining people's estimates of how many marbles are in a jar or what an animal at a country fair would yield in pounds of butchered meat often come quite close to the correct answer.

Plant life may exhibit collective decision making too, Baluška and his colleagues propose in the December Trends in Ecology and Evolution. They urge researchers to look beyond the animal kingdom and into the behavior of plant roots for evidence of crowd wisdom. Information could pass among root tips via secreted chemicals, released



A plant's roots may turn out to show swarm intelligence, much as honeybees or humans can, sharing information and solving a problem as a group

gases or perhaps even electrical activity that connects "brainlike" command centers in root tips, the researchers propose. But however the information travels, the interactions could yield swarmlike decisions about where and how much to grow.

Intelligently swarming roots are plausible, responds Jens Krause of Humboldt University in Berlin, who earlier this year published a review of research on animal and human

swarm intelligence. Now he says he wants to see research presenting a full case for particular examples in plants.

"Applying the notion of swarm intelligence to plants, and not just to animals," Krause says, "is interesting in the sense that swarm intelligence might provide a drive for group living in organismal life in general."

A plant can deploy a considerable number of roots 13,815,672 for a

barley plant according to a classic study Baluška cites. The best evidence for swarm intelligence, Baluška speculates, might be found in exploring how myriad roots grow to exploit nutrient bonanzas that they come across in the soil. Roots also must compete with the roots of other plants for food and water; news from these skirmishes apparently travels far from the front. In earlier experiments dividing a plant's roots between two pots, the

segment in a private pot still shows a response if its counterparts in another container meet some nutrient-sucking intruder. And cutting off part of a root system triggers a reaction elsewhere.

The mechanism behind this how one root finds out what another is up to may be the most controversial part of the smart-roots idea. In their recent commentary, Baluška and colleagues recognize a range of possibilities, but in other papers have explored the idea that news travels via nerve-like electrical signals. Hormonal signals seeping along millimeter-by-millimeter would be too slow, they reason. Contrary to the usual view of plants as living the slow life, they do need fast information transfer.

The idea that plants basically have nerves a conclusion that grows out of hard-to-interpret observations of electrical activity in plant tissue has ignited a thunderstorm of its own among plant scientists in recent years.

"The use of the word intelligence (with or without swarm) simply humanizes (or animalizes, since they talk about swarms) the situation," says David Robinson of the University of Heidelberg in Germany. Such "silly" terminology, in his words, "reduces serious plant science to the level of esoterics."

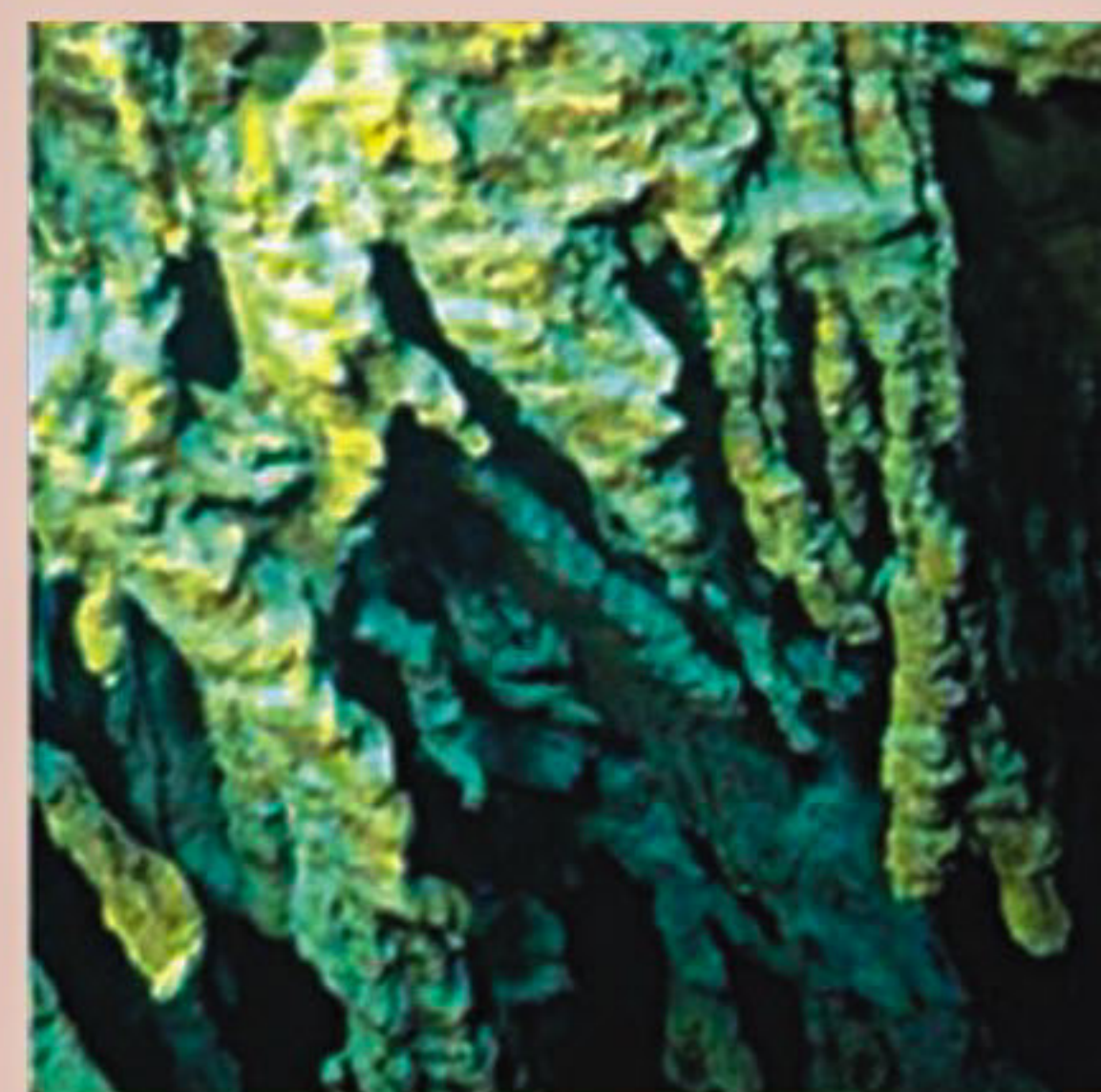
However, he's not disputing the ability of plants to solve complicated strategic problems. "Of course," he says, "it's well known that roots have 'cognitive' abilities."

Source: Science News



'TITANIC ALIENS'

New life in sunken Titanic



The rusticles are delicate, poorly-understood homes for many bacteria

A never-before-seen microbe has been found in the wreck of RMS Titanic. The *Halomonas titanicae* bacterium was found in "rusticles", the porous and delicate icicle-like structures that form on rusting iron.

Various bacteria and fungi live within the delicate structures - first identified on the Titanic - actually feeding off the rusting metal.

The find is described in the journal *International Journal of Systematic and Evolutionary Microbiology*.

Samples of rusticles from Titanic were gathered in 1991 by the *Mir 2* robotic submersible.

Researchers from Dalhousie University and the Ontario Science Centre in Canada and the University of Seville in Spain isolated the *H. titanicae* bacteria from those samples.

They sequenced the microbes' DNA before discovering that they constituted a new member of the salt-loving *Halomonas* genus.

The bacteria are of particular interest because they may shed light on the mechanism by which rusticles form, and thus on the general "recycling" that such microbes carry out on submerged metal structures.

That, the authors point out, has relevance also to the protection of offshore oil and gas pipelines, and the safe disposal at sea of ships and oil rigs.

Source: BBC



BE A EULER!



IN THE BACKYARD

Discovering new primes

PRIME NUMBERS									
2	3	5	7						
Any number under 100 which can not be divided by one of the above numbers is prime.									
11	13	17	19						
Any number under 400 which can not be divided by one of the above numbers is prime.									
23	29	31	37	41	43	47	53	59	
61	67	71	73	79	83	89	97		

DEBASHISH CHAKRABARTY

YOU may think that searching for new prime numbers is a job for super-computers. However, on 13th November 1996, Frenchman Joel Armengaud discovered a new one using his humble PC. He was taking part in the Great Internet Mersenne Prime Search (GIMPS), the brainchild of George Woltman, a computer programmer from Orlando, Florida.

Woltman set up an internet site to distribute a free program for testing Mersenne numbers for primality. As a result, over 700 people from all over the world have taken part. "It gives the average person a chance to participate in the scientific discoveries of tomorrow", said Woltman.

The new prime is a staggering 420,921 digits long. That's enough to fill a 200 page novel. But despite its size it's still only the 35th one of its kind to be discovered. "Finding this new Mersenne prime was quite a thrill! Mersenne primes are very rare, there was only one chance in 35,000 that this Mersenne number would turn out to be prime," said Armengaud.

Despite their rarity mathematicians think there are infinitely many such primes, though this is unproved. In fact, there are many Mersenne numbers smaller than the new prime that remain untested. The message is clear: you too could join the likes of Euler and go down in history as the person who discovered a Mersenne prime.

The writer is a student of Computer Science & Engineering at Brac University, Dhaka

Neem and all its wonders

MALIHA AFRIN

NEEM (Scientific name- *Azadirachta indica*) is an evergreen medium-sized tree which can reach to a height of about 30-40 feet with spread-out branches. Its bark is moderately thick; dark grey outside and reddish inside. Neem tree is usually seen around villages and on roadsides and is considered beneficial for environment. The flowers start appearing from March until May and its fruit becomes ripe during June-August. They are greenish yellow when ripe, and usually contain only one seed.

The neem tree is noted for its drought resistance. It is known as 'sacred tree', 'nature's drugstore', 'village pharmacy' and 'remedy for all diseases'. Almost every part of the neem tree, leaf, bark, flower, fruit, seed and oil is bitter in taste. It is non-toxic and has found many applications in traditional medicine. Neem products have been observed to be antifungal, antidiabetic, antibacterial, antiviral, contraceptive, anthelmintic and sedative. It is used as a major component of Ayurvedic and Unani medicine and is particularly prescribed for skin diseases. Neem leaf, in the form of paste, is applied to the skin to treat spots in the skin and to heal measles and chicken pox, and is also used to boils in the form of a poultice. An extract of leaf (extraction is made by boiling with water) is recommended in ulcers and eczema. A cold water extract of neem (leaf and bark) has shown significant antidiabetic property. It has also the potentiality to control pests in the rural areas. Neem extract does not kill pests directly, but it repels them and affects their growth. The dry flowers are considered as appetizing and a tonic for the body. Neem fruit is regarded as purgative, anthelmintic and soothing to stomach.

Neem seeds contain up to 45% oil, which is usually prepared in 'ghani' (wooden oil mills). It is used to produce cosmetics (soap, shampoo, balms & creams) and is also found to be an effective mosquito repellent. The extracted oil is bitter and has a disagreeable smell. The bitter characteristics of neem oil has been investigated and found to contain 'nimbin', 'nimbinin' and 'nimbidin'. Nimbidin is reported to be free from the



unpleasant smell of the oil and is effective against a variety of skin diseases, septic sores, and ulcers caused by burns. It is useful in treating bleeding gums and pyorrhoea. Extract of neem (leaf and bark) is known to be 'malaria preventive'. In several cases, private initiatives in Senegal proved to be successful in preventing malaria. However, its detailed clinical study is in the preliminary phase.

Maliha Afrin Student of Home Economics College Dhaka.



UNDECIPHERED RONGORONGO



DO YOU KNOW?

Easter Island mystery



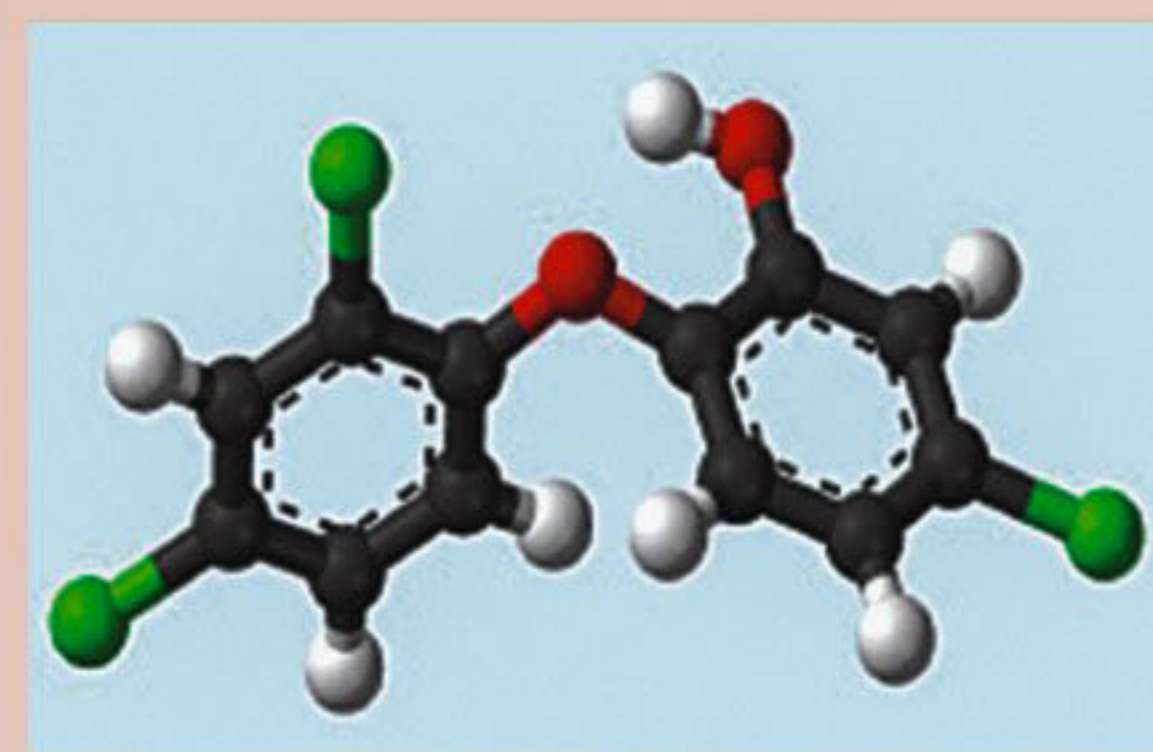
Considered the other "Easter Island mystery," Rongorongo is the hieroglyphic script used by the region's early inhabitants. While no other neighboring oceanic people possessed a written language, Rongorongo appeared mysteriously in the 1700s. However, the language was lost—along with the best hopes for deciphering it—after early European colonizers banned it because of ties to the islanders' pagan roots.

Source: Live Science

What is philosopher's wool?



The compound zinc oxide (ZnO) is called philosopher's wool. Alchemists, as part of their rituals, would burn zinc in air and collect the residue, which formed into white woolly tufts. They called it lana philosophica in Latin, meaning philosopher's wool. Zinc oxide has many uses: as white pigment in paints, component in zinc ointment for treating skin diseases, material in sun screens and sun lotions, in rubber manufacture and in photocopying products.



A model of the structure of a molecule of tricosan. Gray balls represent atoms of carbon; white balls, atoms of hydrogen; green, chlorine; and red, oxygen.

Source: World Science.