



ALL IN ALL

What's New at the Frontiers of
Science, Technology
and
Exploration

Contributed by DANIEL WEISS, MICHAEL FRANCO AND NATALIE THOMPSON



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Row, Row, Row your Roboat

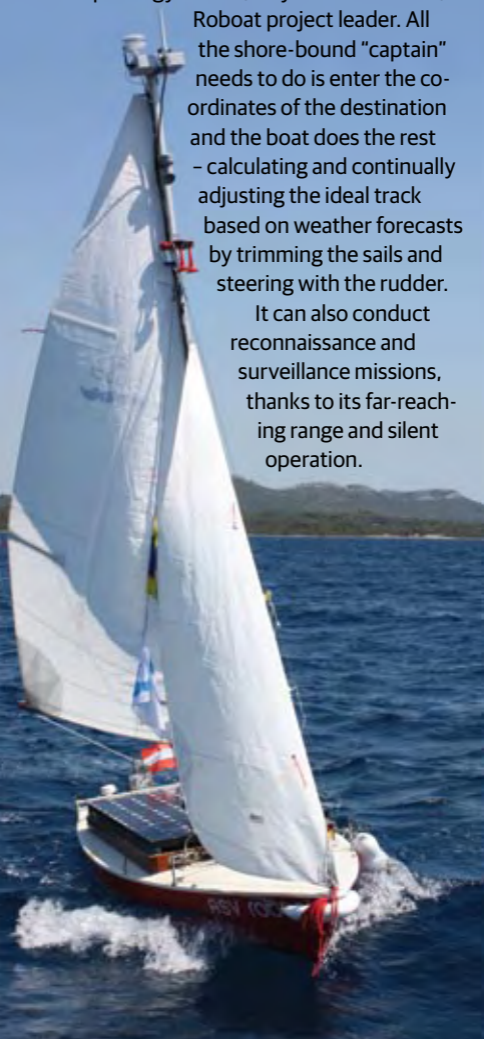
Preparations are under way for the **Micro-transat Challenge**, a transatlantic sailing race due to kick off from southwest Ireland later this year. But unlike other sailing expeditions, crews will remain on shore when their vessels take to the sea. Current favourite is the Austrian ASV *Roboat* (ASV stands for autonomous sailing vessel), which became the first world champion in robotic sailing in 2008.

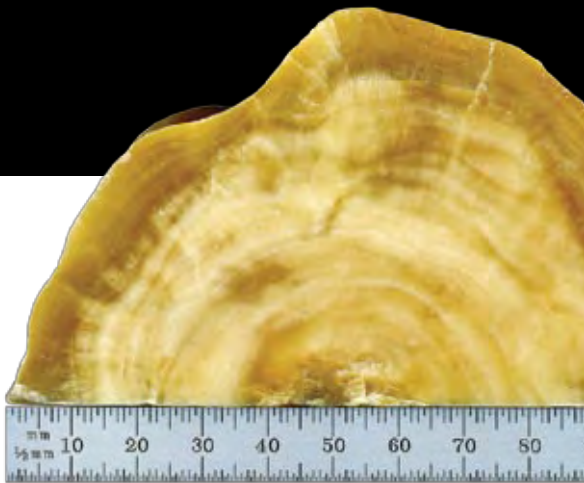
Linux-powered, it comes equipped with sensors that track wind speed and direction; a tilt-compensated compass; humidity, water depth, and air and water temperature monitors; and GPS position and speed readout systems.

"Another special feature is our energy system with solar panels and a direct methanol fuel cell as backup energy source," says Roland Stelzer,

Roboat project leader. All the shore-bound "captain" needs to do is enter the coordinates of the destination and the boat does the rest - calculating and continually adjusting the ideal track based on weather forecasts by trimming the sails and steering with the rudder.

It can also conduct reconnaissance and surveillance missions, thanks to its far-reaching range and silent operation.





Empire Cancelled Due to Bad Weather

Most people know that a tree's age can be calculated by looking at the rings in its trunk. Similarly, scientists analyse rings in stalagmites to learn about age-old climactic conditions. But stalagmites grow very slowly, with acutely narrow rings, so only relatively large blocks of time had been analysed. Until now. Using a tool known as an ion microprobe, a University of Wisconsin-Madison team led by geology graduate Ian Orland and professor John Valley sampled sections of a stalagmite from Israel's Soreq Cave that were just one-hundredth of a millimetre across.

The result was an amazingly detailed analysis of weather patterns across individual years. "Our work gives evidence ... for both a change in the seasonality and a gradual drying of climate in the Levant region from around 100 AD - 700 AD," says Orland. This corresponds to the time when the Byzantine and Roman empires began to decline in both power and population. Could it be that Mother Nature herself may have won the biggest battle of all with the mighty empires? Valley admits that it's unknown whether this weakened the great Mediterranean powers but he finds the correlation interesting.



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Coffee Power

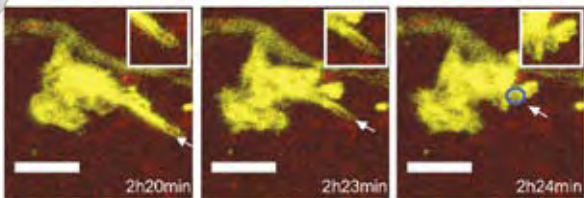
Coffee. It fuels our days, energises our thoughts and powers ... our cars?! According to scientists at the University of Nevada, that may soon be the case. Tests showed that after separating the natural oils from coffee grounds, the liquid could be converted into biodiesel. The new fuel even smelled like coffee. Researcher Manoranjan Misra says he came up with the idea by accident. "I had left my coffee out one night, and the next morning I noticed that there was a kind of oil around the edge of the cup," he says. "Every cup of coffee has it. I decided to do some tests." Now he and his team believe they can produce about 1.3 billion litres of fuel annually from leftovers. And the solids that remain after the extraction can be used as compost or turned into ethanol.

Should a pilot programme prove successful, coffee's pep-power may not only keep drivers buzzing along, it'll keep their cars zipping down the highway as well.

Ice Ice Baby



It may seem strange to build an Ice Cube in the Antarctic, but that's exactly what scientists are doing. Consisting of sensors suspended in ice tubes sunk about 2.5 kilometres below the surface, the giant IceCube telescope will observe neutrinos, tiny yet powerful particles produced from cosmic events like black holes or the explosion of stars. When neutrinos collide with particles of ice, the resulting flash is captured by the sensors and sent to the nearby IceCube lab. "A major goal of IceCube is to identify specific sources of high-energy cosmic rays," says Thomas Gaisser, professor of physics and astronomy at the University of Delaware in the United States, and one of the project's lead scientists. When completed (59 of its planned 86 tubes are in place), IceCube will be the world's largest neutrino telescope, occupying a cubic kilometre of clear ice at the South Pole.



Fantastic Voyage

It's a screen epic - but this drama isn't being played at the cinema. It's a live show thanks to a multiphoton microscope at Sydney's Centenary Institute.

Scientists have, for the very first time, videoed the body's cellular processes in real time. The microscope works by shooting laser beams of light at something to make it fluoresce. Researchers are then able to watch a disease known as Leishmaniasis infect cells in the skin's dermis (second) layer.

According to Professor Wolfgang Weninger, head of the Immune Imaging programme at the Centenary Institute: "We now have a general idea of how pathogens are recognised by the immune system and which cells are involved."

Weninger's team hopes this knowledge will help scientists develop better vaccines with superior targeting mechanisms. In another experiment, the microscope - which has been referred to as the Hubble of medical research - was used to show how cancer cells in living tissue were invaded and destroyed by good T-cells. This new and fantastic insight into disease processes gives, say the researchers, unprecedented clarity into what's going on in the body. Which means no more cinematic micro-subjects being injected into humans? Shame!