Moves are afoot to probe the lake trapped beneath Antarctic ice

Lake Vostok, isolated from the rest of the biosphere for at least a million years, could be the subject of an international initiative to plumb its secrets.

Some 80 scientists from 14 countries will meet in Cambridge, England, next week to formulate plans for exploring one of the world's last uncharted natural wonders: Lake Vostok, which is buried beneath four kilometres of ice in East Antarctica.

Interest in the lake stems mainly from the fact that it has been isolated from the rest of the biosphere for at least one million years — some researchers say perhaps 35 to 40 million years. "The driving force behind this effort is the prospect of finding organisms that have evolved in ways we might not have considered possible," notes Todd Sowers, a palaeoclimatologist at Pennsylvania State University.

Indeed, the US space agency NASA is interested in the exploration of Lake Vostok for a related reason: it offers a 'testbed' for the search for alien life in the ice-covered ocean thought to exist on Jupiter's moon Europa.

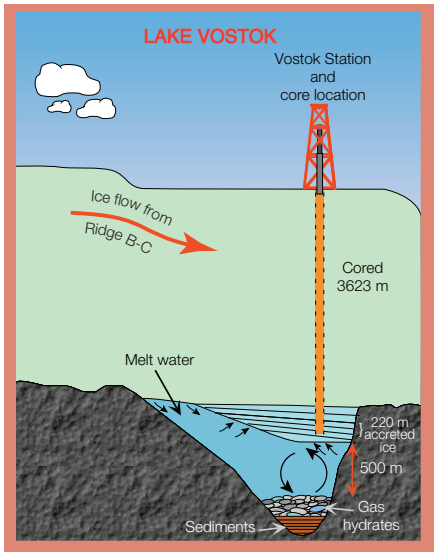
The full extent of Lake Vostok was not appreciated until 1996, when analysis of radar and seismic data revealed that it is 200 kilometres long, covers some 14,000 square kilometres and is up to 500 metres deep (see *Nature* **381,** 684–686; 1996).

Last year, following discussions with the Scientific Committee on Antarctic Research (SCAR), scientists completed work on the Vostok ice core, stopping at a depth of 3,623 metres — about 120 metres above the ice/lake interface — to avoid contaminating the lake's water with drilling fluid.

The lake is still untouched, but scientists have been working on a safe means of probing its hidden reaches. The Cambridge meeting, to be held at Lucy Cavendish College, is sponsored by SCAR. It "intends to get hard answers to crucial scientific questions about the lake and to establish a format for an international research programme there", says conference chair Cynan Ellis-Evans, a microbiologist with the British Antarctic Survey.

'Curiosity' or scientific target?

The meeting follows a workshop in Washington last November, sponsored by the National Science Foundation (NSF), which addressed the question of whether Lake Vostok is merely a 'curiosity' or an important target for scientific investigation. "A consensus emerged that there were compelling scientific reasons for studying this lake that go well beyond the thrill of exploration," says Robin Bell, a geophysicist at Columbia University's Lamont-Doherty Earth Observatory, who co-chaired the NSF workshop.



ROBIN BELL

Going down: so far, exploration of the ice above Lake Vostok has stopped 120 m above the ice/lake interface, owing to fears of contamination.

One goal of the Cambridge meeting, says Bell, is to formalize the scientific rationale for exploring Lake Vostok and to draw up a more rigorous agenda for studying the lake. "We've got to bring everybody up to speed and to identify the main gaps that need to be filled before we can take this to the next level and begin actual exploration," adds Sowers.

The general outlines of a plan are already emerging. The first task will be a geophysical site survey — to be conducted by Bell and colleagues — that would use new radar, seismic, gravity and magnetic data to map the boundaries of the lake and help discover its origins.

The depth of the lake and sediment thickness would be measured and salient features such as hot springs identified. The discovery of hot springs would be an important breakthrough, says Michigan State University microbiologist James Tiedje, as it would reveal a source of energy that could sustain life in the lake.

The next step would be to lower observing instruments into the lake. This would be done by using a standard hot-water drill to carve a hole down into the ice to within about 100 metres of the lake surface.

A bullet-shaped probe — carrying a suite of instruments, cameras and perhaps small tethered robotic submarines — would use a heated tip to melt its way through the last stretch of ice, sealing itself in from behind upon freezing. Information would be relayed by cable to the surface.

The final phase would be to use deep coring techniques to drill into the lake in order to retrieve water and sediment samples for examination in the laboratory. "Many aspects of this programme have never been done and have no documented approaches," a NSF panel concluded last year.

Keeping clean

Accessing the lake in a non-contaminating fashion will be a challenge, says Bell, "as you have to worry about getting both in and out cleanly. We also have to find a way of keeping a hole through the ice open without freezing in — something that has never been done before in such thick ice sheets."

All told, says Ellis-Evans, "this will be an enormous undertaking, on a scale unprecedented in Antarctica". Perhaps two dozen cargo flights would be needed merely to bring in the equipment necessary for hot-water drilling, he says, and even more to deploy the larger drill for obtaining samples.

That leads to the other critical goals of the Cambridge meeting: finding ways to finance such a large-scale effort and establishing an organizational framework for doing so. "SCAR is stepping forward by running this workshop," says Bell, and may therefore be the logical choice for the coordinating role.

On the funding front, NSF has agreed to pay for the geophysical site survey. "Everything hinges on getting that survey done," says Bell. He says that once it is under way, which could be within a year or two, coring could begin within about five years.

But NSF is not prepared to fund the entire exploration, says glaciologist Julie Palais, the foundation's Antarctic programme manager. "This is a big international effort and we're just one part of it." Palais is attending the Cambridge meeting to gauge the scientific interest from other countries and to see how much money they are willing to contribute.

"It will be a real challenge to pull this off, so we need to make a strong scientific case," Sowers says. "The money won't come unless we can convince people that this is a worthwhile endeavour."

Steve Nadis