

to comparably enlarged European and North American tree rings dated at 1628 B.C., the investigators contend.

Some kind of environmental disturbance produced a dramatically cooler, wetter climate throughout much of the world, resulting in these alterations in tree growth, they propose. The main candidate for this disturbance is a volcanic eruption that took place on the Aegean island of Thera (SN: 4/16/88, p. 251), the researchers hold.

That volcanic blast, or perhaps another one that has yet to be identified, spewed out a blanket of dust that drastically reduced the amount of sunlight reaching Earth's surface, they propose. As a result, soil remained unusually moist that year and contributed to expanded growth of annual tree rings.

Archaeologists have recently uncovered pumice, presumably derived from the Thera eruption, in sediment surrounding the remains of a palace from ancient Egypt, Renfrew notes. The palace

belonged to a dynasty traditionally thought to have assumed power in 1550 B.C. If Kuniholm's group proves correct about the 1628 B.C. date of Thera's eruption, substantial changes may have to be made in the chronology of ancient Egypt, says Renfrew.

However, an "unassailable causal link" does not yet exist between the Thera eruption and the unusual spurt of tree growth in ancient Turkey or elsewhere, the British researcher contends.

"We're saying we have evidence for a global climatic event in late 1629 B.C. or early 1628 B.C.," asserts Cornell's Maryanne Newton, a tree-ring researcher and a member of Kuniholm's team. "It wasn't necessarily the Thera eruption, but the Turkish sites in our study were downwind from Thera."

Although critical questions remain, Kuniholm's project "offers the best hope we have for a really sound chronology for the later prehistory and history of the Near East and Egypt—and indeed the eastern Mediterranean in general," Renfrew concludes. — *B. Bower*

was just a few billion years old. McMahon and Hu have spied a second galaxy in the vicinity, they reported June 10 at a meeting of the American Astronomical Society in Madison, Wis.

A grouping of two ordinary galaxies and a quasar does not necessarily a cluster make, McMahon emphasizes. Quasars, dazzling powerhouses that may represent an unusual type of galaxy, seem more likely than other objects to reside in groups. Yet McMahon says that the discovery, together with evidence of clustering later in the history of the cosmos, suggests that astronomers may find larger groupings in the early universe as telescopes like Keck deepen their view.

"Seeing even one object this far away is difficult, and so finding even another one is suggestive of clustering," says Mark A. Dickinson of the Space Telescope Science Institute in Baltimore.

"It's dicey; they really don't have enough data," says Cohen. But, she adds, the finding could be the "beginning of a great discovery."

Cohen says she and other astronomers, including Lennox L. Cowie of the University of Hawaii, have confirmed her team's evidence of clustering later in cosmic history by analyzing the Hubble Deep Field, the most detailed deep-sky images ever made. At a workshop in Cambridge next week, Dickinson plans to present observations of a cluster of galaxies dated slightly earlier than that of Cohen's team.

At the Madison meeting, Matthew A. Malkan and his colleagues at the University of California, Los Angeles reported finding two clusters of infant galaxies dating from about one-third the universe's current age. This places them even earlier in cosmic history than Dickinson's finds but later than those reported by Hu and McMahon. — *R. Cowen*

A cluster of observations poses puzzles

If the life of the universe were a book, the later parts would be clearly legible. It's the early chapters that remain fuzzy.

Using the world's largest optical telescope, the 10-meter W.M. Keck atop Hawaii's Mauna Kea, several teams of astronomers have recently taken a leap back in time, sketching in some of the details about the cosmos shortly after its birth some 10 to 20 billion years ago.

In May, Judith G. Cohen of the California Institute of Technology in Pasadena and her colleagues reported that distant galaxies, viewed as they appeared when the cosmos was half its current age, were clumped together rather than distributed evenly across the sky. The finding suggested that this lumpiness in the cosmos may have arisen earlier than some theories can easily account for (SN: 4/27/96, p. 260). Now, another Keck observation

hints that such clustering might have occurred earlier still, when the cosmos was less than one-fifth its current age.

The new findings focus on the region surrounding the distant quasar BR 2237-0607. Last year, Richard G. McMahon of the University of Cambridge in England and Esther M. Hu of the University of Hawaii in Honolulu found what appears to be a young, ordinary galaxy in the neighborhood of the quasar (SN: 9/30/95, p. 212). The galaxy's measured redshift of 4.5 means that the light now reaching Earth left the galaxy when the cosmos

Growers bee-moan shortage of pollinators

Most people in the northern half of the United States will remember the winter of 1996 for record snows that seemed to take forever to melt. Apiculturists, however, will remember it as the winter their bees died.

"We've been hearing regularly of people who lost 80 or 90 percent of their [commercial] honeybees," reports Anita M. Collins of the Agriculture Department's bee research lab in Beltsville, Md. Honeybees, the most versatile and widely cultivated of natural pollinators, play a pivotal role in the fruiting or seed development of numerous plants, including at least 30 U.S. crops valued together at about \$10 billion annually, according to Roger Morse of Cornell University.

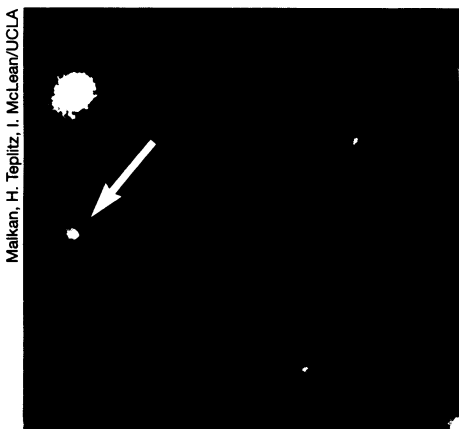
The shortage extends beyond the snow belt and managed bee colonies, observes Gary P. Nabhan, of the Arizona-Sonora Desert Museum in Tucson. In Arizona, for instance, "we've seen a 70 percent loss in

[wild] honeybees since 1991," he says. Nationally, he reports, only about 2.7 million wild and managed honeybee colonies exist—fewer than half as many as 50 years ago. "And half this loss," he notes, "occurred within just the last 5 years."

The pandemic spread of two parasitic mites has fostered this decline in the honeybee population. "We know they are everywhere now in the United States," Collins says of the mites, and "perhaps one-quarter of the [bee] colonies have both."

The tracheal mite, which entered the United States from Mexico in 1984, burrows holes through the inside wall of a bee's windpipe to get at the insect's equivalent of blood. The *Varroa* mite, which entered the country 3 years later, attaches to the outside of the honeybee and sucks out this bloodlike fluid.

The parasites weaken, but do not kill, the honeybees. However, Collins says, new data



This galaxy (arrow) is part of a newly found cluster that dates from when the universe was one-third its current age.

Malkan, H., Teplitz, I., McLean/UCLA



Giant swallowtails pollinate zinnias.

suggest that they increase the insects' vulnerability to disease and early death.

In another 10 years, U.S. honeybees may become resistant to the mites, Morse predicts, just as their kin in Europe and South America have. For now, he says, "we're just squeaking through."

Indeed, bee nurseries weren't able to supply beekeepers with all the stock they requested this year, Collins notes. "So if we get a big kill like this next year," she says, "Lord knows what will happen."

The honeybee crisis "is part of a larger pattern of pollinator declines," Nabhan notes. A report he prepared last month lists more than 180 species of vertebrate pollinators—including geckos, hummingbirds, warblers, parrots, bats, weasels, and lemurs—that are threatened with extinction.

In *The Forgotten Pollinators* (Island Press, Washington, D.C.), to be published next month, Nabhan and pollination ecologist Stephen L. Buchmann of the Carl Hayden Bee Research Center in Tucson link falling numbers of these vertebrates, as well as insect pollinators other than bees, to two major phenomena: inadvertent poisoning with pesticides and human activities that fragment an animal's habitat.

At a press conference this week, the pair stated that funding is urgently needed to develop pollinators that can substitute in the near term for honeybees. They say that most of the pollination scientists whom they have surveyed agree.

Buchmann and Nabhan also suggest that national programs extend the protection given the habitats of endangered plants to the habitats of the plants' pollinators and that farmland retired under the conservation reserve program be planted with forages attractive to important pollinators. — J. Raloff



Popular foods and flowers requiring insect pollination.

Giant lake hides beneath Antarctica's ice

The Age of Discovery may have ended long ago, but somebody forgot to tell the cadre of researchers studying Antarctica. So little is known about the frozen continent that it appears as a featureless white splotch on most maps. Now, Russian and British glaciologists are filling in the void with the news that Antarctica harbors one of the world's largest and deepest freshwater lakes, concealed under 4 kilometers of ice.

"Lake Vostok is enormous. It's 200 km long and 50 km wide. It's the size of Lake Ontario," says Martin J. Siegert of the University of Wales in Aberystwyth.

The announcement has excited biologists because the lake probably contains ancient forms of microbes that have lived undisturbed for a half million years or more under the ice.

Gordon de Q. Robin of the University of Cambridge in England and his colleagues first discovered the lake in the 1970s while conducting airborne surveys near Russia's Vostok Station, about 1,200 km from the South Pole. Radiowaves penetrating the ice revealed a body of water beneath Vostok, but the size of the lake remained unknown. Using data collected recently by the ERS-1 satellite, A.P. Kapitsa of Moscow State University, Robin, Siegert, and their colleagues have now mapped it.

The satellite-borne radar, which measures the topography of the surface of the Antarctic ice sheet, detected an extremely flat region surrounding Vostok Station. The ice remains level there because it is floating, whereas most of the ice sheet rests on uneven bedrock, the researchers report in the June 20 *NATURE*.

By charting the area of flat ice, the scientists found that Lake Vostok covers 14,000 square km, an area 50 percent bigger than previous estimates. They also determined that the lake contains fresh water, judging from the thickness of the ice and the height at which it floats.

To measure the depth of the lake, the team examined 30-year-old seismic soundings made originally by Kapitsa before the lake was discovered. In reanalyzing these data, the group found faint echoes from the bottom of the lake, which measures 510 meters at its greatest depth, placing it among the world's 10 deepest lakes.

Although Vostok Station boasts the coldest recorded temperatures on Earth, the lake exists because the bottom of the ice sheet is warm enough to melt. The thick glacial blanket serves as insulation, protecting the base of the ice sheet from the frigid conditions at the surface. Meanwhile, geothermal heat from Earth warms the lowermost ice, says glaciologist Charles Bentley of the University



A satellite image of Antarctica shows Lake Vostok outlined in red (arrow).

of Wisconsin-Madison.

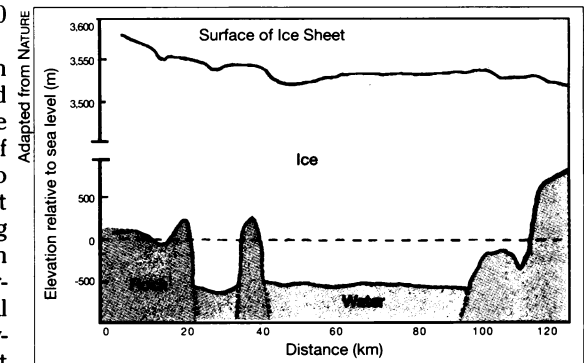
The southern end of the lake lies directly under the spot where Russian and French scientists have drilled the world's deepest ice hole, which currently extends some 3,348 m. The Vostok crew plans to continue drilling later this year but has agreed to stop about 50 m above the lake surface to keep from polluting the water (SN: 6/1/96, p. 341).

Scientists studying the ice drilled at Vostok have found species of living bacteria, yeast, and other microbes with ages ranging from 3,000 to 200,000 years old. Some of these organisms probably also exist in the sediments of the lake below the ice sheet, where they could be 500,000 to 1 million years old, says David Wynn-Williams, a microbiologist at the British Antarctic Survey in Cambridge.

"The organisms down there have not been affected by PCBs, by heavy metals, by nuclear bomb fallout, by elevated ultraviolet light, and all that sort of thing," says Wynn-Williams. "There could be genes that have been lost over the years with the changing climate and pollution. So there's a potential for new enzymes, new antibiotics, new metabolites of one sort or another."

Before they search for these hoary microbes, scientists must first develop techniques for tapping the water without spoiling it. Given the expense of working in Antarctica and concerns about pollution, the Russian researchers have no immediate plans to probe Lake Vostok.

— R. Monastersky.



A cross section of the ice sheet and the lake beneath.