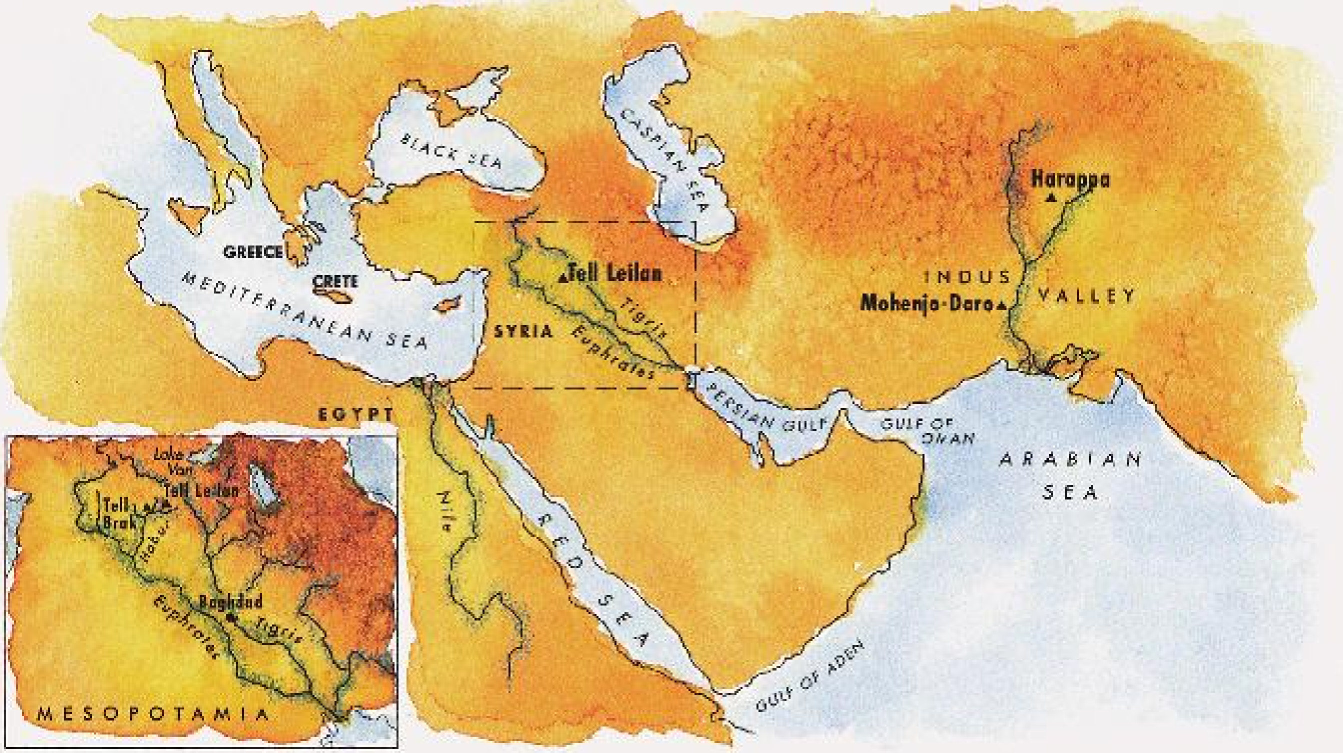
Not if you ask Harvey Weiss. Weiss, professor of Near Eastern archeology at Yale, has challenged one of the cherished notions of his profession: that early civilizations—with their monuments and their grain reserves, their texts and their taxes—were somehow immune to natural disaster. He says he's found evidence of such disaster on a scale so grand it spelled calamity for half a dozen Bronze Age cultures from the Mediterranean to the Indus Valley—including the vaunted vale of Mesopotamia. Historians have long favored political and social explanations for these collapses: disruptions in trade routes, incompetent administrators, barbarian invasions. "Prehistoric societies, simple agriculturists—they can be blown out by natural forces," says Weiss. But the early civilizations of the Old World? "It's not supposed to happen."

Yet happen it did, says Weiss, and unlike his predecessors, he's got some data to back him up. The evidence comes from a merger of his own archeological expertise with the field of paleoclimatology, the study of climates past. His first case study concerns a series of events that occurred more than 4,000 years ago in a region of northern Mesopotamia called the Habur Plains. There, in the northeast corner of what is present-day Syria, a network of urban centers arose in the middle of the third millennium B.C. Sustained by highly productive organized agriculture, the cities thrived. Then, around 2200 B.C., the region's new urbanites abruptly left their homes and fled south, abandoning the cities for centuries to come.

Weiss believes that the inhabitants fled an onslaught of wind and dust kicked up by a drought that lasted 300 years. He also believes the drought crippled the empire downriver, which had come to count on the agricultural proceeds of the northern plains. Moreover, he contends, the long dry spell wasn't just a local event; it was caused by a rapid, region-wide climate change whose effects were felt by budding civilizations as far west as the Aegean Sea and the Nile and as far east as the Indus Valley. While the Mesopotamians were struggling with their own drought-induced problems, he points out, neighboring societies were collapsing as well: the Old Kingdom in Egypt, early Bronze Age cities in Palestine, and the early Minoan civilization of Crete. And in the Indus Valley, refugees fleeing drought may have overwhelmed the cities of Mohenjo-Daro and Harappa. The troubles of half a dozen Bronze Age societies, says Weiss, can be blamed on a single event—and a natural disaster at that.

Weiss first presented this scenario in 1993, when soil analyses showed that a period of severe dust storms accompanied the mysterious Habur hiatus. "I was thinking you can't have a microregion drought," he recalls, "because that isn't how climate works. It's got to be much bigger. And I said, 'Wait a minute, didn't I read about this in graduate school? Weren't there those who, 30 years ago, had said that drought conditions were probably the agency that accounts for all these collapses that happened in contiguous regions?' " says Weiss. "Back in the late sixties, we had read this stuff and laughed our heads off about it."

In 1966, British archeologist James Mellaart had indeed blamed drought for the downfalls of a whole spectrum of third-millennium civilizations, from the early Bronze Age communities in Palestine to the pyramid builders of Egypt's Old Kingdom. But when Mellaart first put forth this idea, he didn't have much in the way of data to back him up. Weiss, however, can point to new paleoclimate studies for his proof. These studies suggest that an abrupt, widespread change in the climate of western Asia did in fact occur at 2200 B.C. Samples of old ocean sediments from the Gulf of Oman, for



BRONZE AGE cultures possibly crippled by drought: The early Minoan in Crete, the Old Kingdom in Egypt, the cities Mohenjo-Daro and Harappa, and the Akkadian Empire in Mesopotamia.

Previous pages: Harvey Weiss

MAP BY BETTE DUKE

THE CURSE OF AKKAD DESCRIBES "LARGE FIELDS" THAT "PRODUCED NO GRAIN" AND "HEAVY CLOUDS" THAT "DID NOT RAIN." SCHOLARS HAD DECIDED THAT THESE EXPRESSIONS WERE MERE METAPHOR.

example, show signs of extreme drought just when Weiss's alleged exodus took place. A new model of air-mass movement explains how subtle shifts in atmospheric circulation could have scorched Mesopotamia as well as points east, west, and south. And recent analyses of ice cores from Greenland—which offer the most detailed record of global climate change—reveal unusual climatic conditions at 2200 B.C. that could well have brought drought to the region in question.

"I'VE GOT SOME FIGURES I CAN SHOW YOU. FIGURES always help," says paleoclimatologist Peter deMenocal, swiveling his chair from reporter to computer in his office at Columbia University's Lamont-Doherty Earth Observatory, just north of New York City. On the monitor, deMenocal pulls up a graph derived from the research project known as GISP2 (for Greenland Ice Sheet Project 2). GISP2 scientists, he explains, use chemical signals in ice cores to reconstruct past climates. There are two kinds of naturally occuring oxygen atoms, heavy and light, and they accumulate in ice sheets in predictable ratios that vary with prevailing temperatures. In a cool climate, for example, heavy oxygen isotopes are less easily evaporated out of the ocean and transported as snow or rain to northern landmasses like Greenland. In a warm climate, however, more heavy oxygen isotopes will be evaporated, and more deposited in the Greenland ice sheets.

By tracking oxygen-isotope ratios within the ice cores, the GISP2 graph reflects temperatures over Greenland for the past 15,000 years. Near the bottom of the graph, a black line squiggle wildly until 11,700 years ago, when the last ice age ended and the current warm era, the Holocene, began. The line then climbs steadily for a few thousand years, wavering only modestly, until 7,000 years before the present. From then until now, global temperatures appear relatively stable—"then until now" comprising, of course, the entire span of human civilization.

"The archeological community—and actually segments of the paleoclimate community—have viewed the Holocene as being climatically stable," says deMenocal. "And so they imagine that the whole drama of civilization's emergence took place on a level playing field in terms of the environment."

Until he met Harvey Weiss, deMenocal wasn't much interested in studying the Holocene; like most of his peers, he was more drawn to the dynamic climate fluctuations that preceded it. In fact, the Holocene had something of a bad rep among climatologists. "It was thought of as kind of a boring time to study," says deMenocal. "Like, why would you possibly want to? All the action is happening 20,000 years earlier."

Then a few years ago he read an account of Weiss's drought theory and had an epiphany of sorts. It occurred to him that even the smallest variations in climate could be interesting if they had influenced the course of history. What if something was going on in the Holocene after all? He looked up the 1993 paper in which Weiss had laid out the evidence for the Habur hiatus and reported the results of the soil analysis.

"I was pretty skeptical," says deMenocal. "I mean, what would you expect if everyone left a town? It would get dusty. Especially in the world's dustiest place. Big surprise."

Weiss, meanwhile, was getting a similar response from many of his peers. But when he and deMenocal met at a conference in 1994, they hit it off right away—largely because Weiss, too, was dismayed at the paucity of his own evidence. "Peter was immediately sensitive to my moaning about how we needed additional data, different kinds of data," says Weiss. "And he immediately understood where such data could be obtained."

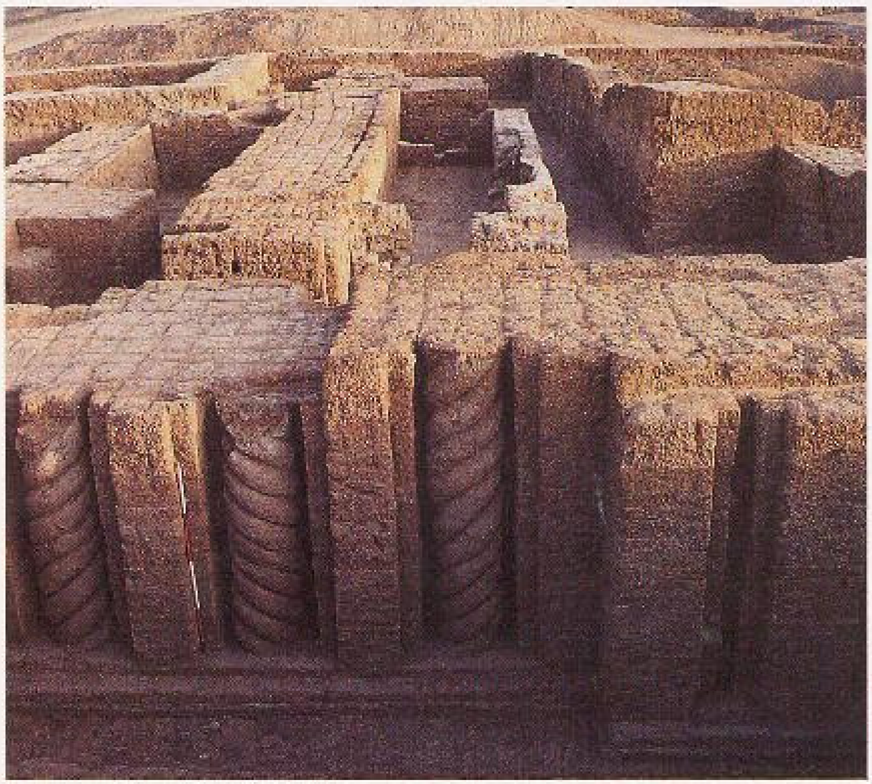
DeMenocal told Weiss that if a large-scale drought had in fact occurred, it would have left a mark in the sediments of nearby ocean floors—the floor of the Gulf of Oman, for example. Lying approximately 700 miles southeast of ancient Mesopotamia, the gulf would have caught any windblown dust that swept down from the Tigris and Euphrates valleys. (The Persian Gulf is closer, but because it's so shallow, its sediments get churned up, thereby confusing their chronology.) And deMenocal just happened to know some German scientists who had a sediment core from the Gulf of Oman.

Analysis of the gulf core is ongoing, but deMenocal has already extracted enough information to confirm Weiss's suspicions. To track dry spells in the sediments, he and his colleague Heidi Cullen looked for dolomite, a mineral found in the mountains of Iraq and Turkey and on the Mesopotamian floodplains that could have been transported to the gulf only by wind. Most of the Holocene section of the core consists of calcium carbonate sediments typical of ocean bottoms.

"And then all of a sudden, at exactly 4,200 calendar years, there's this big spike of dolomite," says deMenocal—a fivefold increase that slowly decays over about three centuries. The chemistry of the dolomite dust matches that of the dolomite in the Mesopotamian mountains and plains, verifying the mineral's source. And not only did deMenocal and his colleagues figure out what happened, they may have figured out how. Studies by Gerard Bond at Lamont-Doherty have shown that the timing of the drought coincided with a cooling period in the North Atlantic. According to a survey by Cullen of current meteorological records, such cooling would have dried out the Middle East and western Asia by creating a pressure gradient that drew moisture to the north and away from the Mediterranean.

"The whole disruption, collapse bit, well, I just have to take Harvey at his word," says deMenocal. "What I tried to do is bring some good hard climate data to the problem." Why hasn't anybody seen this signature of calamity before? Simple, says deMenocal. "No one looked for it."

WEISS'S FIRST HINTS OF CLIMATE-ASSOCIATED calamity came from a survey of his principal excavation site, a buried city in northeastern Syria called Tell Leilan. Tell Leilan (rhymes with "Ceylon") was one of three major cities on the Habur Plains to be taken over by the Akkadian Empire around 2300 B.C. The city covered more than 200 acres topped by a haughty acropolis, and was sustained by a tightly regulated system of rain-fed agriculture that was co-opted and intensified by the imperialists from the south. Weiss had asked Marie-Agnès Courty of the National Center for Scientific Research in France to examine the ancient soils of Tell Leilan to help him understand the agricultural development of the region. She reported that a section dating from 2200 to 1900 B.C. showed evidence of severe drought, including an eight-inch-thick layer of windblown sand and a marked absence of earthworm tunnels.



THE CITY OF TELL Leilan was abandoned in 2200 B.C. and resettled about 300 years later. These spiral columns from a Tell Leilan temple date from about 1850 B.C.

Harvey Weiss

In his own excavations of the same period, Weiss had already found evidence of desertion: mud-brick walls that had fallen over clay floors and were covered with, essentially, 300 years' worth of compacted dust. And once he made the drought connection at Tell Leilan, he began turning up clues to the catastrophe everywhere he looked. In 1994, for example, Gerry Lemcke, a researcher at the Swiss Technical University in Zurich, presented new analyses of sediment cores taken from the bottom of Lake Van in Turkey, which lies at the headwaters of the Tigris and the Euphrates. The new results indicated that the volume of water in the lake—which corresponds to the amount of rainfall throughout western Asia—declined abruptly 4,200 years ago. At the same time, the amount of windblown dust in the lake increased fivefold.

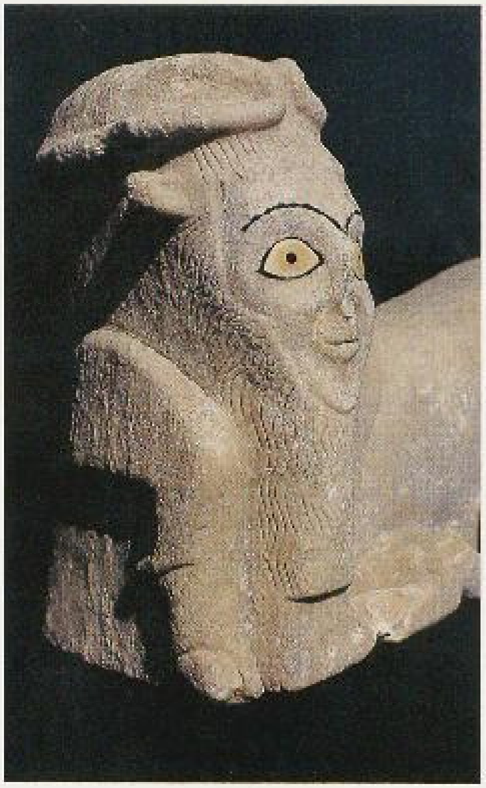
Weiss came to believe that the effects of the drought reached downriver to the heart of Mesopotamia, causing the collapse of the Akkadian Empire. The collapse itself is undisputed: written records describe how, soon after it had consolidated power, Akkad crumbled, giving way to the Ur III dynasty in—when else?—2200 B.C. The cause of this collapse has been the subject of considerable speculation. But Weiss's studies of early civilizations have convinced him that their economies—complex and progressive though they may have been—were still fundamentally dependent on agricultural production. In fact, he notes, one hallmark of any civilization is that it requires a life-support system of farming communities toiling away in the fields and turning over the fruits of their labor to a central authority. The drought on the Habur Plains could have weakened the Akkadian Empire by drastically reducing agricultural revenues from that region. People fleeing the drought moved south, where irrigation-fed agriculture was still sustainable. For want of a raindrop, the kingdom was lost.

"Well, believe it or not, all my colleagues had not figured that out," says Weiss. "They actually believed that somehow this empire was based on bureaucracy, or holding on to trade routes, or getting access to exotic mineral resources in Turkey." But the drought itself is documented, Weiss says, in passages of cuneiform texts. Images from a lengthy composition called the Curse of Akkad, for example, include "large fields" that "produced no grain" and "heavy clouds" that "did not rain." Scholars had decided that these expressions were mere metaphor.

And many still stand by their interpretations. "I don't agree with his literal reading of the Mesopotamian texts, and I think he has exaggerated the extent of abandonment in this time period," says Richard Zettler, curator of the Near East section at the University of Pennsylvania's Museum of Archaeology and Anthropology in Philadelphia. Zettler doesn't question the evidence for drought, but he thinks Weiss has overplayed its implications. Although Tell Leilan may well have been deserted during the putative hiatus, for example, nearby cities on the Habur Plains show signs of continuing occupation, he says. As for the Curse and other Mesopotamian passages describing that period, says Zettler, "there are a lot of questions on how to read these texts—how much of it is just literary license, whatever. Even if there is a core of historical truth, it's hard to determine what the core of truth is."

Instead of backing down in the face of such commentary, Weiss has continued to document his thesis. Echoing Mellaart, he points out that 2200 B.C. saw the nearly simultaneous collapses of half a dozen other city-based civilizations—in Egypt, in Palestine, on Crete and the Greek mainland, and in the Indus Valley. The collapses were caused by the same drought, says Weiss, for the same reasons. But because historians and archeologists look for internal rather than external forces to explain civilizations in crisis, they don't communicate among themselves, he says, and many aren't even aware of what's going on next door, as it were.

"Very few people understand that there was a synchronous collapse and probably drought conditions in both Egypt and Mesopotamia," let alone the rest of the Old World, says Weiss.



CRITICS OF WEISS'S theory point to cities that remained occupied throughout the purported crisis. This human-headed bull came from one such city, Tell Brak, near Tell Leilan.

IT DIDN'T HELP WEISS'S EXTRAVAGANT CLAIMS for third-millennium cataclysm that his alleged drought didn't appear in the GISP2 oxygen-isotope record. The graph in deMenocal's office, for example, has no spikes or dips or swerves at 2200 B.C., just a nice flat plateau. That graph was drawn from an interpretation of the ice-core data. But according to Paul Mayewski of the University of New Hampshire in Durham, who is chief scientist of GISP2, there are plenty of reasons a drought in western Asia might not make it into the oxygen-isotope record in the Greenland glacier. Greenland might be too far away to "feel" the regional event, or the drought may have left a different kind of chemical signature. Only a climatologist like Mayewski could explain these reasons, however. And no one asked him to.

"As a consequence, a lot of people called Harvey Weiss and said, 'Well, the GISP2 record is the most highly resolved record of Holocene climate in the world. And if it's not in there, you're wrong, Harvey,'" says Mayewski. "I didn't realize that poor Harvey was being abused for not existing in our record."

Fortunately Mayewski, like deMenocal, is a curious sort with interests a bit broader than his own specialty. When he happened upon Weiss's 1993 paper, he'd already lent a hand on a few archeological projects, including one on the disappearance of Norse colonies from Greenland in the mid-1300s. But he figured other scientists had already looked for the Mesopotamian drought in the climate record. When he finally met Weiss in 1996, he learned otherwise. Mayewski began reanalyzing his core data with Weiss's theory in mind, and he uncovered a whole new Holocene.

"We can definitely show from our records that the 2200 B.C. event is unique," says Mayewski. "And what's much more exciting than that, we can show that most of the major turning points in civilization in western Asia also correlate with what we would say would be dry events. We think that we have found a proxy for aridity in western Asia."

Earlier interpretations of the GISP2 data had measured a variety of ions in ice cores that would reveal general information about climate variability. To look for the 2200 B.C. drought in particular, Mayewski used tests based on 2.5-year intervals in the climate record instead of 50- to 100-year intervals. He also collected a broader set of data that allowed him to reconstruct specific patterns of atmospheric circulation—not only over land but over land *and* oceans. When Mayewski focused on the movement of air masses over oceans, he found that air transport from south to north in the Atlantic—so-called meridional circulation—hit a significant winter low some 4,200 years ago. Mayewski and deMenocal are studying how this event relates to drought in western Asia.

"But it seems on the basis of the paleoclimatic data that there is no doubt about the event at 2200 B.C.," says Weiss. "What the qualities of this event were, and what the magnitude of this event was, that is the current research frontier now."

Trouble is, even though the drought may seem like a sure thing, its effects on Mesopotamia are still unproved, as Zettler points out. They will remain controversial, Weiss admits, until archeologists better understand the contributions of politics, agriculture, and climate in the formation of ancient societies. That mission grows more urgent as more archeologists seem ready to grapple with models of "climatic determinism." In the past few years, drought and flooding have been cited in the demise of several New World civilizations, including the Maya of Central America, the Anasazi of the American Southwest, and the Moche and Tiwanaku of Peru and Bolivia.

"Until climatic conditions are quantified, it's going to be very difficult to understand what the effects of climate changes—particularly controversial, abrupt ones—were upon these societies," says Weiss. The precise constellation of forces that led to the collapse of Bronze Age cultures around 2200 B.C. will probably be debated for a very long time. But paleoclimatology has assured Mother Nature a place in that constellation. And the notion that civilizations are immune to natural disaster may soon be ancient history.

Joan Oates