DESERT STORM

Drought, wind and dust, not failing leadership or military conquest, brought destruction to the first of the ancient civilizations

BY HARVEY WEISS

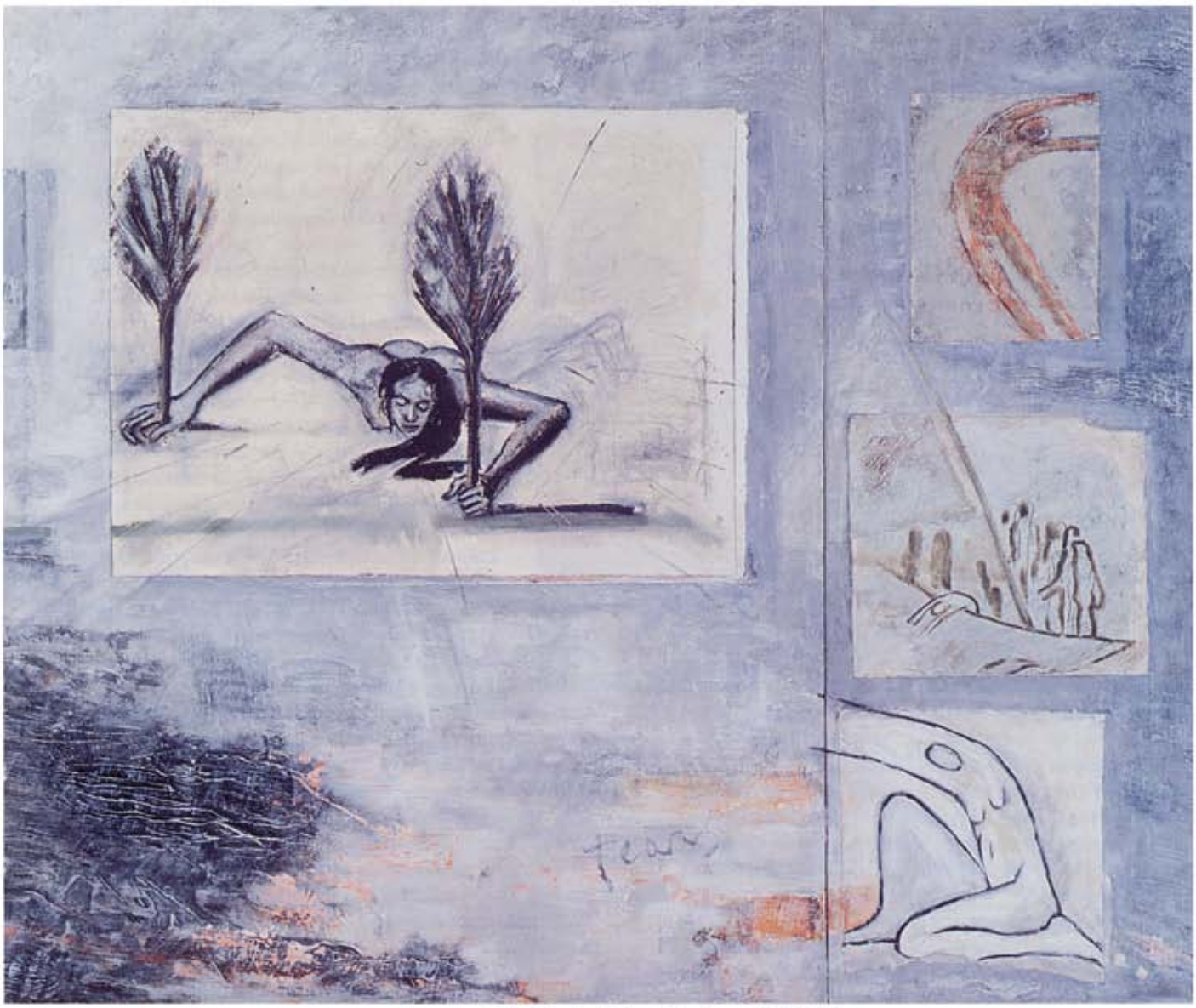
The large fields and acres produced no grain
The flooded fields produced no fish
The watered gardens produced no honey and wine
The heavy clouds did not rain . . .
On its plains where grew fine plants,
'lamentation reeds' now grew.
—"Curse of Akkad" c. 2100 B.C.

FIRST OF THE WORLD'S EMPIRES, AKKAD WAS not the last to blame its fall on sacrilege. In a fit of pique, the author of the curse believed, the Akkadian emperor had destroyed a temple to the sky god Enlil, bringing on a century of drought, famine and barbarian invasions. How else to explain the empire's sudden, calamitous decline?

Only a hundred years before the collapse, Sargon of Akkad had wrested the Sumerian city-states from Lugalzagesi of Umma, then stormed across the plains of Mesopotamia. When he was done the Akkadian Empire controlled trade from the silver mines of Anatolia to the lapis lazuli mines of Badakhshan, from the cedar forests of Lebanon to the Gulf of Oman. In northern Mesopotamia, meanwhile, fortresses were built to control imperial wheat production. To the south, irrigation canals were extended, a new bureaucracy established and palaces and temples built from imperial taxes.

Then, abruptly, things fell apart. Sometime around 2200 B.C. seasonal rains became scarce, and withering storms replaced them. The winds cut through northern wheat fields and blanketed them in dust. They emptied out towns and villages, sending people stumbling south with pastoral nomads, to seek forage along rivers and streams. For more than a hundred years the desertification continued, disrupting societies from southwestern Europe to central Asia. Egypt's Old Kingdom, the towns of Palestine and the great cities of the Indus Valley also were among the casualties.

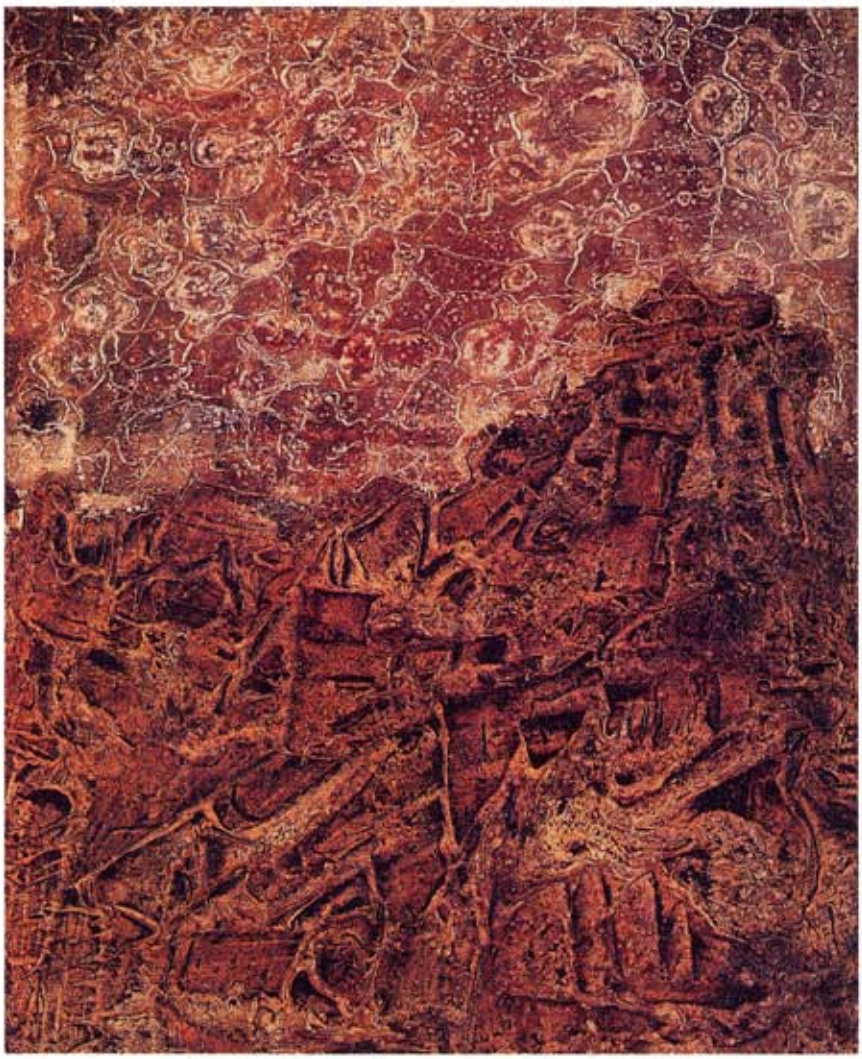
Or so new evidence has affirmed. Like the poet of the curse, archaeologists and epigraphers have been reluctant to



Mary Frank, Before My Eyes, *1994–96*

blame Akkad's collapse on climatic change. Yes, there were dry spells, they have said, but the real problem was poor management. Sargon and his descendants failed "to integrate the traditional leadership of the city-states into the new venture of imperial expansion," according to the Assyriologist Norman Yoffee of the University of Michigan in Ann Arbor. As a result, they "increased the traditional centripetal tendencies among the city-states and also made the empire vulnerable on its flanks." Too many mergers and acquisitions, in other words, and not enough synergy.

And the "Curse of Akkad"? Pure metaphor. Assyriologists, abetted by the postmodern penchant for ripping text from context, sometimes take everything literally except for literature. The curse was a typical "dying city lament," they have said, marked by the kind of metaphors always licensed in the ancient Near East. Never mind that the Mesopotamian laments were written when cities happened to be dying.



Jean Dubuffet, Ermitage en Pays Gluant, *July 7, 1952*

In 1993 I was a coauthor of a paper in the journal *Science* that ultimately took the city laments at their word. At the time, the debate about the reality of a climatic catastrophe had grown as weak and fitful as the summer wind over Mesopotamia. In 1981 Robert M. Adams, then at the University of Chicago and later secretary of the Smithsonian Institution, published *Heartland of Cities,* a massive summary of his southern Mesopotamian archaeological surveys. Adams noted the existence, in passing, of evidence of a "short, major, wind-erosion cycle" in late-third-millennium southern Mesopotamia. But almost no one thought his point worth pondering. The archaeologist Joseph A. Tainter, in his 1988 book *The Collapse of Complex Societies,* declared it doubtful that "any large society has ever succumbed to a single-event catastrophe." Catastrophism, everyone else agreed, suffered from seductive ideas, skimpy data and simplistic causal analysis.

Our paper disrupted that calm consensus. In northern Mesopotamia, we suggested, sites had been abandoned for 300 years, triggering a massive southern migration. To the south, clay tablets from the same period described waves of northern immigrants—descriptions confirmed by Adams, whose surveys showed that the southern population had doubled within a hundred years of the Akkadian collapse. Syrian soil, we wrote, held the key to those events. Examined under the microscope, soils from the same 300-year period showed a great deal of windblown dust, little evidence of earthworm activity and other signs of aridity. Climatic change, we concluded, was the first domino that sent Akkad toppling.

THE CONTROVERSY THAT ENsued provoked a deep sense of déjà vu. In 1980 the late physicist Luis W. Alvarez and his son Walter, a geologist at the University of California at Berkeley, had offered the now-famous impact hypothesis to explain the mass extinctions at the end of the Cretaceous period. Traces of iridium between Cretaceous and Tertiary limestone had led them to argue that a meteor six miles wide crashed into the earth 65 million years ago. The resultant impact, they said, darkened the planet with dust for several years.

Most paleontologists were laughing in the aisles. The dinosaurs and other fauna had done themselves in, they said, by failing to adapt to a slowly cooling planet. They were outmaneuvered by smaller, wilier mammals. The Alvarezes were not specialists in paleontology, critics added; they could not appreciate the complex adaptations implied by the fossil record.

Then, of course, the anomalous layer of iridium continued to turn up all over the world. Extremely rare in the earth's crust, the metal could have come only from a meteor, and it always appeared between Cretaceous and Tertiary strata. In 1990 a likely site for the meteor's impact was found: a 65-million-year-old crater at least 120 miles wide, on the northern tip of the Yucatán Peninsula. Gradually, grudgingly, the Alvarez hypothesis became

the leading explanation for the extinction of the dinosaurs.

I have often been reminded of the mass-extinction debate in the years since our paper appeared in *Science*. The Holocene catastrophe, like the Cretaceous one, was at first dismissed out of hand. And like Luis and Walter Alvarez, its proponents have been accused of simplemindedness, sensationalism and hysteria. As the millennium approaches, late-third-millennium catastrophism is giving rise to gale-force controversy, hurling together champions of chaos and causality, contingency and determinism. Bit by bit, however, a new consensus is emerging. The Holocene catastrophe, recent findings show, left traces as indelible as the iridium layer.

WAGNERIAN AS IT NOW SEEMS, THE DEBATE was born in one of the world's quietest places. Tell Leilan lies on the Habur Plains of northern Mesopotamia, in modern-day Syria. A major city during the third millennium B.C., it covers more than 200 acres, and it is marked by an acropolis that rises sixty feet above the plains.

In 1978, when I first led a team of Yale University archaeologists to Tell Leilan, the area had a dicey reputation among westerners: it was one large sand dune, people at home assumed, a dune covered with terrorists. In fact, as it turns out, a day in New Haven, Connecticut, is more dangerous than a year at Tell Leilan. And northern Syria is one of the bread baskets of western Asia, a sort of Near Eastern Kansas. From the top of the acropolis, one can see fields of wheat rolling unimpeded to Turkey and the hovering foothills of the Taurus Mountains. Five thousand years ago, those rain-fed plains were even more fertile than they are today.

Like Syria today, northern Mesopotamia was badly underappreciated when we began excavations and field surveys. In a 1978 textbook, Charles L. Redman, an archaeologist at Arizona State University in Tempe, acknowledged that the towns of northern Mesopotamia developed similarly to southern city-states. "But they cannot be considered city-states," he went on, "because of their small size and a lack of emphasis on central institutions and specialized activities." In Mesopotamia, Redman and other archaeologists believed, the south was the exclusive cradle of civilization. Farmers there had to irrigate their crops to survive, but their yields were double those in the north. Northern farmers sat back and let seasonal rains water their crops—and waited for the south to bring them civilization.

Our excavations soon undermined important parts of that consensus. Between 2600 and 2400 B.C., we found, Tell Leilan grew sixfold in size, from thirty-seven acres to more than 200. The city's residential quarters were carefully planned, with straight streets paved with potsherds and intersected with drainage alleys. Central storerooms in the acropolis, sealed and overseen by administrators, held grain for redistribution.

When Sargon's grandson invaded northern Mesopotamia shortly after 2250, the city was further expanded. Naram-Sin's army dismantled nearby towns, consolidating populations in cities such as Tell Leilan. There the deportees were reorganized and put to work tending imperial wheat fields and building city walls in return for standard Akkadian rations of barley and oil. Throughout Mesopotamia, massive cultivation projects were organized, temples were built and seafaring trade was regulated to points as distant as the Indus Valley—a blueprint for the later imperial glories of Assyria and Babylon.

Tell Leilan's development is eye-opening, from an archaeological standpoint, with or without the catastrophe that interrupted it. The Akkadians, our excavations showed, did not bring civilization to the north and turn one-horse towns such as Tell Leilan into bustling cosmopolitan cities. In fact, something like the opposite took place: the Akkadians relied on preexisting northern cities to sustain their imperial venture.

THE AKKADIAN OCCUPATION OF TELL LEILAN, in any case, was to last less than a hundred years. Only decades after the city's massive walls were raised, its religious quarter renovated and its grain production reorganized, Tell Leilan was suddenly abandoned. In our excavations the collapsed remains of Akkadian buildings are covered with erosion deposits that show no trace of human activity. Only above them, in strata from 1900 B.C., do ash, trash, and the monumental remains of a new imperial capital appear.

Striking as it is, the site's occupational hiatus came as no surprise to us. Archaeologists first documented it in the late

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1930s at other sites in the region, relegating it to a footnote. Fifty years later, when our team rediscovered the odd hiatus, we went one step further. By determining radiocarbon dates for materials from before and after the hiatus, we refined its chronology. By comparing ceramics from our site with ceramics from the same strata at other sites, we tracked the hiatus throughout the area. Whether at Tell Leilan or Tell Taya, Chagar Bazar or Tell al-Hawa, the results told the same story: between 2200 and 1900 B.C. people fled the Habur and Assyrian plains en masse.

Joining forces with Marie-Agnès Courty, a soil scientist and archaeologist at the National Center for Scientific Research (CNRS) in Paris, we then gave the soil an even closer reading. First we exposed the hiatus strata in the lower town and acropolis. Then Courty prepared thin sections of successive layers of soil and microscopically examined their mineral content, structure and form.

Little by little, evidence of previously unrecorded climatic events emerged. A thin layer of volcanic ash, Courty found, covers the last Akkadian mud bricks. Just above that a layer of fine sand eight inches thick testifies to centuries of flailing wind and relentless drought. A volcanic eruption probably could not have caused the disaster, but whether one did so may be unimportant. No matter what caused them, dust storms and drought made rain-fed farming difficult if not impossible. Year after year crops failed in

northern cities. When the cities collapsed—thereby destroying much of the empire's wealth—they took the southern economy down with them. Thereafter neighboring Gutian "barbarians" stormed the imperial capital in the south, soon overwhelming Akkad.

Periods of drying climate are nothing new to Near Eastern archaeologists. Evidence of growing aridity in the late-third millennium has been accumulating for decades, albeit with very fuzzy chronological outlines in some regions. What *is* new are the data showing sudden, severe, long-term climatic change—and its puzzling occurrence immediately after a volcanic event. Add to those findings the simultaneous social collapses previously documented, in exhaustive detail, in the Aegean, Egypt, Palestine, Iran and the Indus Valley, and you have a provocative picture indeed. The problem, oddly enough, is that archaeologists have been ignoring it for decades.

THE POSTWAR, BABY-BOOM GENERATION OF Near Eastern archaeologists (me included) was preoccupied with the origins of civilization. Following Robert Adams's lead, we tried to dissect the evolution of societies in southern Mesopotamia, tracing the emergence of craft specialization and social stratification, political centralization and urban settlements. The rise of the world's first cities and states, we believed, was a gradual adaptive process.

In previous decades archaeologists had used all their resources to document the very existence of such civilizations. They had traced the growth and efflorescence of societies in the Aegean, Egypt, the Indus Valley and western Asia. Then, just before the Second World War, they began to notice a curious decline—a decline that always seemed to take place at the end of the third millennium. In Egypt, the Old Kingdom, during which the great pyramids were built, gave way to the turmoil of the First Intermediate Period; in Palestine, Early Bronze Age towns were abandoned; in Mesopotamia, Akkad collapsed and nomadic peoples made strange movements across and down the Euphrates and Tigris valleys.

MY GENERATION OF NEAR EASTERN *archaeologists looked for gradual changes* within *a civilization, not sudden changes from without.*

In 1948 the French archaeologist Claude F. A. Schaeffer cast his eye over the urban collapses of the third millennium and concluded that regionwide earthquakes were to blame. A decade later the British archaeologist James Mellaart fingered drought and migrations as the culprits. Schaeffer's hypothesis seemed too fantastic for serious study; Mellaart's, though less improbable, still depended on a deus ex machina. Neither one interested us, in any case. We were concerned with gradual changes *within* a civilization, not sudden changes imposed from without.

Scholars trying to explain Akkad's demise mostly resorted to what the social scientist Jon Elster of Columbia University calls "story-telling": they paraphrased ancient sources and appended vague, unsubstantiated explanations. The empire, they concluded, was laid low by "imperial weakness" (but of what kind and why?) and "invading barbarians" (but why were they emboldened to invade? and why were they successful?). Sargon's descendants, in their quest for exotic goods and metals, overextended the empire.

But why was northern Mesopotamia abandoned? Nearly forty years after we ignored Mellaart, ironically, our research has begun to prove him right. Hard-nosed empiricism has led straight back to the abrupt-climatic-change hypothesis: a sweeping explanation built on a mountain of detail.

OPPONENTS OF THE ABRUPT-CLIMATIC-change hypothesis tend to fall into one of three camps. The first camp, largely made up of epigraphers, could be called political essentialists. According to Norman Yoffee, for instance, social collapses in Mesopotamia were caused by weak dynasties. Sargon's descendants simply lost the loyalty of peripheral peoples who provided them with goods and services. In 1979 Yoffee blamed the shrinking and bureaucratization of the Old Babylon empire on a failure to integrate "traditional locally autonomous controls within and among city-states within the larger sociopolitical organization." In 1988 he explained the Akkadian collapse in similar terms. More recently, the French epigrapher J. - J. Glassner, also at CNRS, dismissed the abrupt-climatic-change hypothesis as crude environmental determinism. "Man is the essential factor," he philosophized, "the major geographical agent who preoccupies the historian."

Opponents in the second camp—the cultural determinists one might call them—are a bit more tolerant of environmental variables. Drought, they say, may well have contributed to the fall of ancient civilizations, but other factors pushed them to the edge.

Palestine is a supposed case in point. According to Arlene M. Rosen, an archaeologist at Ben Gurion University in Beersheva, Israel, the Palestinian climate did grow more arid through the third millennium, but Palestinian towns could have saved themselves. Had local rulers been more flexible and less bound by class interests and a supposedly rigid religious ideology, she believes, they might have built irrigation canals. Contemporary Egyptians and Mesopotamians did build such canals, and Rosen contends that Palestinians in the Middle Bronze Age built them as well. Earlier Palestinians just could not bring themselves to adopt them.

Rosen's conclusions, unfortunately, are built on a misconception. Palestinian water resources and topography ruled against the construction of irrigation canals. The only evidence of Middle Bronze Age irrigation in Palestine is a stone-lined drainage system at Hazor that likely carried town sewage into surrounding fields. In Rosen's view, cultures control their own fates; they just have trouble changing directions. By her definition, an ancient society is like a dinosaur—"a lumbering colossus," in the words of Joseph Tainter, "fixed in its morphology, incapable of rapid change." In fact, Tainter points out, there is ample evidence of ancient societies' adapting to changing environ-

mental conditions. And Early Bronze Age Palestine is a good example. In 2200 B.C., faced with the same disastrous drought that struck Mesopotamia, Palestinian farmers had to abandon their towns and fields and head for the hills. They neither controlled their fate nor failed to adapt.

THE THIRD CAMP OF ANTICATASTROPHISTS has even less patience with seemingly simple answers (this group prefers "flabby multiple causality," as one of my students put it). Their analysis of Egyptian history is a good example. The Nile's seasonal flooding sustains Egyptian agriculture. Without it, the Nile Valley would be as barren as the desert it bisects. It comes as no surprise, therefore, that the fall of the Old Kingdom in 2200 B.C. was triggered by a drop in the river's flow. In 1971 the astronomer Barbara Bell of the Harvard–Smithsonian Center for Astrophysics in Cambridge, Massachusetts, demonstrated that fact by reviewing records of famine in the Old Kingdom. Flood failures and famine, she concluded, accompanied the collapse. Only later, when the climate improved and the Nile regained its previous levels, did Egyptian economy and politics restabilize.

A straightforward story, one might think. But Karl W. Butzer, a geoarchaeologist at the University of Texas at Austin, has a different view. Butzer describes the third-millennium-flood failures as only the nadir of a long dry spell in tropical Africa—a short-term anomaly much like the Sahel droughts of the 1970s. The Old Kingdom was liable to fall in any case, he contends. Ancient Egyptian society periodically collapsed because of class exploitation, leadership vacuums and ecological stress. The Nile was "the most prominent agent overall" but not "a determinant" of the Old Kingdom's collapse.

It is easy to miss the forest for the trees in such arguments. How is one to weigh the relative influence of every variable within a complex causal chain? If, contrary to history, the Nile had not diminished for 200 years, would the Old Kingdom have survived? If so, would not surviving make the river a determining factor in the calculus of collapse? The answer, if it is reached on the basis of Egyptian data alone, might be merely rhetorical. But take a long step back

Jaime Suárez, Topografía Interior, *1988*

and a good look at much of the Old World in 2200 B.C. Then the answer becomes quite simple, if not compelling.

POLITICAL ESSENTIALISTS, CULTURAL DETERMINists and devotees of flabby multiple causality frequently share a single trait: they rarely talk to their neighbors. Focused on individual cultures, they naturally conclude that local collapses had local causes; they never notice the other ancient cultures collapsing around them.

Civilization on Crete and mainland Greece, like its neighbors, collapsed in 2200 B.C. The conventional explanation: overcultivation and soil erosion. The great cities of Mohenjo-daro and Harappa in the Indus Valley collapsed between 2200 and 2100 B.C. The archaeologist M. Rafique Mughal of the Pakistan Department of Archaeology blames shifting river courses, citing evidence that the Indus River channels moved eastward, away from Harappan urban centers. But other archaeologists argue that there was no collapse—just "decentralization" and "localization" caused, according to the archaeologist J. Mark Kenoyer of the University of Wisconsin at Madison, by "the overextension of socioeconomic and ritual networks and the fatal disruption of the economic base."

Almost any cause for the collapses will do, it seems, except the one that explains them all. Civilizations rise and fall all the time, a layman might suggest. Could the collapses be coincidental? Not at all. There is no pattern of collapse in 2700 B.C. or in 2500 B.C., only in 2200. The Old World civilizations of the third millennium did not fall at random.

The geoclimatic data are, if anything, even more suggestive. According to recent analyses by Françoise Gasse and Elise van Campo of CNRS, dry spells and drops in lake levels took place in the Sahel, the Sahara, northwestern India and western Tibet roughly between 2600 and 2200 B.C. Archaeological evidence such as ours, Gasse recently told me, may be refining the chronology of that climatic event. Thomas C. Johnson of the University of Minnesota in Duluth has shown that Lake Turkana in Kenya abruptly changed from an open to a closed basin around 2000 B.C. And around 2250 B.C. the level of the Dead Sea reached a nadir.

Ocean sediments tell a still more compelling story. According to the geologist Gerard C. Bond of Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, sediments between Greenland and Iceland show a cold peak around 2200 B.C. On the basis of an analysis of modern climatic data by James W. Hurrell, a climatologist at the National Center for Atmospheric Research in Boulder, Colorado, such a cold peak would have caused a dry spell in southern Europe and western Asia.

But the strongest evidence of the abrupt climatic change—and the first one that expresses it in solid numbers—will soon be published by the paleoclimatologist Peter B. deMenocal and his student Heidi Cullen, both also at Lamont-Doherty. Wind turbulence and dust deposition in Mesopotamia, deMenocal reasoned, should have left a measurable, datable record on the floor of the Gulf of Oman. Borrowing cores that had already been analyzed for earlier geologic periods, he measured the past 20,000 years' dust sediment in the gulf. Windblown dolomite dust, deMenocal showed, makes up 2 percent of the sediment's weight throughout the Holocene. Except, that is, during two periods: around 4200 B.C., when the amount of dust almost doubled; and around 2300 B.C., when dust suddenly increased fivefold and then, within a few centuries, suddenly dropped back to normal. DeMenocal also retrieved shards of volcanic glass from the dust peak. The gulf sediments bear a more than intriguing resemblance to the soil samples Marie-Agnès Courty brought back from Tell Leilan.

What could have caused such a cataclysmic climatic swing? Geoclimatologists offer a few timid hypotheses—"El Niño teleconnections," for instance, or "thermohaline events"—but all remain unproved, and they will remain so until the event itself is fully described. When I asked one prominent investigator to suggest a cause for the climatic change, he looked dumbfounded. "Don't you understand?" he said, shaking his head. "If I could answer that, I would get the Nobel Prize."

INVESTIGATORS WHO SUPPORT THE ABRUPT-climatic-change hypothesis have sometimes been accused of seeing what they want to see. But that criticism is best turned on its head. For decades, one could say, catastrophes were so unfashionable among archaeologists that we ignored the evidence in front of our noses. We sought other explanations for social collapses because we wanted them to be true.

THE STRONGEST EVIDENCE *for abrupt climatic change comes from cores of dust sediment on the floor of the Gulf of Oman.*

The dramatic data now emerging may change the picture. In the next few years Holocene-climate conferences will sprout from the ground like mushrooms after a rainstorm. As archaeologists confront the data behind the abrupt-climatic-change hypothesis, we may begin to ask why some societies fled and others stood their ground, finding new ways to survive and reinventing their polities.

Often enough, I believe, flight was the better option. By abandoning urban life and migrating to areas where agriculture remained sustainable, societies such as the one at Tell Leilan demonstrated their resilience and adaptability. Three hundred years later, when the wind and the dust had subsided, their descendants were heir to a new efflorescence. In Egypt the Middle Kingdom picked up where the Old Kingdom had left off. In Crete the Minoan Kingdom centered at Knossos reorganized the scattered descendants of Early Bronze Age societies. And in Mesopotamia the dynasties of Shamshi-Adad and Hammurabi organized empires more efficient than that of the Akkadians. The storms of the third millennium, they showed, were only a single accident in a vast historical process—a reminder that causality and chance each play a role in human affairs. •

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