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THE TEETH OF TIME

SCIENCE fiction echoes science in its passion for vast perspectives of time and space. The time machine and the rocket are our favored icons of interest.

I'm sure that is why science fiction readers so frequently are interested in archaeology, Neanderthals, and the broad panorama of the past. Our fascination runs in both directions of time.

Thanks to science (from physics to archaeology), within the last two centuries our appreciation of the expanses of time, fore and aft of our own precious Now, has expanded enormously.

Two centuries ago, Schliemann had not yet unearthed Troy, and Napoleon's forces were so oblivious to the importance of antiquity that they supposedly shot the nose off the Sphinx for target practice. (Recent study suggests that vandals removed the nose by hand, however.) French Pleistocene cave art was defaced in the 1800s with signatures (thoughtfully dated), in part because the visitors had no idea of the vast age of the paintings.

Advances in radioactive dating and astronomical cosmology have left us standing, as a species, on a vast plain, with perspectives of time stretching from our murky origins to the universe's cosmological destiny. This is a recent condition, quite modern. Ancient societies assumed a comforting stasis, that life and culture would go on for long essentially infinite eras, sharing a common perspective and even religion. Whipsawed by incessant, accelerating change, the modern mind lives in a fundamental anxiety about the passing of all referents, the loss of meaning.

On the scale of a mere century, individually we die. To persist beyond this means to survive through surrogates: family, nation, schools of thought in philosophy, science, or art, religious communities. We have evolved with passionate loyalties to these larger units, probably because they do promise continuity, a consolation for personal mortality.

Over a millennium, neither politics nor technology are sure standards. Only languages, religions, and cultures retain their identity. A thousand years ago, Europeans were crude villagers on the edge of the advanced civilization, the Arabs; but the seeds of Western emergence lay in their culture. Over such spans, only a strategy of what I shall call deep time messages can suffice to propagate anything -- an idea, remembrance of a person, cultural works, or even a simple signature.

So far, ten thousand years is the upper limit of conscious, planned deep time communication. Not coincidentally, this is roughly the age of civilization. Little comes to us from beyond this scale except crude signs, notches in stone

or antlers, mute stacks of stones, and cave paintings of mysterious intent. Ten millennia ago we lived in hunter-gatherer tribes just hearing about a hot new high-tech approach: agriculture.

Our numbers then took off under that most important of all technological revolutions. Agriculture and fishing appear to have been driven by necessity, as our burgeoning population made old hunter-gatherer modes inadequate. The efficiency of planting seeds and harvesting in turn benefited from the warmer climate coming after the ending of the last ice age. Soon came cities, many novelties, and enough amassed wealth to build more permanent, stony tributes to the powers of the day. Quite quickly, the Egyptians and Chinese began erecting monuments to themselves. The impulse seems buried deep within us.

Such early testaments convey pride, even grandeur, but little more. Many ancient monuments are unmarked and mysterious, like the Sphinx, Stonehenge, and the American mounds. Probably most were not tributes to their builders, but religious sites or mausoleums. Deeper motives may have pervaded societies which we, at our great remove, can only dimly sense.

A leading puzzle of far antiquity is why the ancients often built with great stones, moving burdens intimidating even to modern engineers. Managing a hundred-ton rock is far more difficult than placing ten ten-ton stones. Yet scattered over the lands of ancient civilizations are countless large stoneworks. At Ba'albek in Lebanon an 800-ton boulder still stands, carefully placed to form a temple wall. The temple's monolithic columns are equally massive. Such feats give clear evidence that the ancients could build on scales comparable to ours, through hard, protracted labor.

Such sites provoke awe, and the sheer numbers of large stoneworks argues that techniques for building them were broadly known and highly developed. Some archaeologists, seemingly innocent of engineering finesse, invoke the "more guys with ropes" explanation to explain how such works came about. More likely, specialized equipment and perhaps traveling artisans helped.

Recently an engineer charged with erecting a monolith of Stonehenge scale devised a counterweight method to tip the 40-ton stone into its support hole. Laying a wooden rail atop the horizontal stone, he put a heavy rock on the rail, near the larger stone's center.

A small team then pushed the rock weight to the end of the monolith, levering it up until it slid into the slot, standing tall. Probably such tricks made ancient works far easier than the "ramps, ropes, and sweat" style often assumed. Further, such feats could give a sense of control over daunting masses that may have been an enduring satisfaction for the entire society. Look what we did, such works proclaimed to generations unborn.

These surmises about ancient motivations seem plausible, but we must remember that they are guesses made through our cultural filters. Some societies (China, Latin America) think in terms of family dynasties, making investments which bear fruit fifty or a hundred years downstream, and passing on homesteads.

Ninety-year mortgages are not unknown.

In contrast, our modern attention span is usually quite short. Most industrial societies have an attitude increasingly fixed on the bottom line. Stocks had better show a good quarterly statement, and long-range research is uncommon in industry. In this century, many countries have failed to outlive their citizens. Physicist Hal Lewis wryly notes that "There wouldn't be so many proverbs exhorting us to prepare for the future if it weren't so unnatural." Most people consider their own grandchildren the farthest time horizon worth worrying about.

Such views are quite sensible. Why invest thought and effort in such chancy pursuits? Over ten millennia, qualitative changes dominate quantitative ones. Even fervently held values and ideals are totally plastic. Tempocentric notions of "the human condition" do not survive.

Confronted with one of our current skyscraper monoliths of glass and steel, what would a citizen of the year 5000 B.C. think? No doubt these soaring towers would provoke awe. On the other hand, what perspective would a person of the year 5000 A.D. bring? That ours was a great era, perhaps-- or merely that for some reason, possibly without noticing, we made our grandest buildings in the same shape as our gravestones?

Indeed, our current concern for the past itself may not be long-lasting. We moderns have watches and clocks to fix us in the immediate moment, ticking off each second. Some of our notorious anxiety probably stems from these ever-present reminders. Paradoxically, we have leisure and inclination to study the past as never before. Both these aspects may change.

Dire circumstances -- and nearly all history can be described so, compared with our luxurious present -- shorten people's interests and attention spans. In our era, high culture has increasingly reached backward in time, expending great efforts in archaeology and other sciences, almost as if we seek our identity in distant ancestors.

The low culture form of this is nostalgia, and as cultural critic Dean MacCannell notes, nostalgia may come from our notion of progress:

The progress of modernity... depends on its very sense of instability and inauthenticity. For moderns, reality and authenticity are thought to be elsewhere: in other historical periods and other cultures, in purer, simpler lifestyles. In other words, the concern of moderns for 'naturalness,' their nostalgia and their search for authenticity are not merely casual and somewhat decadent, though harmless, attachments to the souvenirs of destroyed cultures and dead epochs. They are also components of the conquering spirit of modernity--the grounds of its unifying consciousness.

Associating the past with naturalness is often unconscious, and we shall meet this idea again.

Time itself isn't what it used to be. We moderns labor under a sense of linear

time that emerged forcefully after Pope Gregory XIII imposed the Julian calendar on the Catholic world in 1582. Linear calendars had been around from the ancient world, but drifted out of synchronization with the seasons because of bad fits to Earth's actual orbital period.

Astronomical measures of duration embody only one of several concepts of time. Social time might be defined as the cycle of events according to beliefs and customs, subject to language and even fashion. Cultures can conceive time and space less abstractly, as in traditional Chinese concepts, which held that time proceeds by felt cycles, as mirrored in weather and sky. They imagined time to be "round," whereas space was "square."

Further, media reflect emphasis on either time or space. Heavy materials such as thick parchment, clay and stone stress time and endurance. Media emphasizing space-saving are apt to be light and less durable, such as papyrus and paper. These are suited to easy dispersal of information and are prized by administrations, which have short attention spans. We hear down the corridors of history from either the original, durable media, or the flimsy forms which must be continuously renewed, as in the copying of ancient texts by monks in medieval times. Our century's electromagnetic media, from radio to the optical disk, are more perishable still.

In a sense all technologies are attempts to contest the ordinations of time. Agriculture tries to make crops grow to order, medicine delays the onslaughts of age and death, transportation moves us faster, communication media strive for speed and preservation of information. There is a touch of eternity in the photograph, a technology for preserving the moment that would have astonished the ancients.

Beginning in the nineteenth century, critics sought to undermine the very notion of timelessness. They held that monuments mediate memory and insist that remembrance remains inert, moored in the landscape, ignoring the essential mutability of all cultural works.

Nietzsche disdained any vision of history that pretended to permanence. Lewis Mumford pronounced "monumentalism" dead since it clashed with his sense of the fluidity of the modern. "If it is a monument, it is not modern, and if it is modern, it cannot be a monument." Lacking the quality of renewal, monuments gave "a false sense of continuity." He saw this as essentially a moral failing, since by not putting their faith in renewal, out of vanity the powerful then mummified the moment into a petrified immortality. "They write their boasts upon tombstones, they incorporate their deeds in obelisks; they place their hopes of remembrance in solid Stones joined to other solid stones, dedicated to their subjects or their heirs forever, forgetful of the fact that stones that are deserted by the living are even more helpless than life that remains unprotected and preserved by stones."

Even quite recently, some find memorials destructive. Pierre Nora warns, "Memory has been wholly absorbed by its meticulous reconstruction." As James Young remarks, "To the extent that we encourage monuments to do our memorywork for us,

we become that much more forgetful."

These views stem from short horizons. "Memory-work" necessarily transforms and ebbs as centuries roll on. Legends warp. To be sure, in broad outline, folk memory is surprisingly long-lived. Modern Australian aborigines recall landmarks that were flooded since the last ice age, 8000 years ago; divers verified their existence. But much of this information is cloudy; to what does the mythical beast they call the "bunyip" correspond?

The modernist fear of rigidity already seems a bit antique. Already modernism has entertained newer ideas, including "postmodernism," which seeks to undermine the meaning of texts. (This seems a passing fashion, more a mistaking of momentary cultural exhaustion for a fresh, innovative view.) It seems likely that anti-monumental thinking is fading faster than will messages which attempt to speak across gaps of language, culture and intention.

Our own individual pasts get filtered by later experiences of time's flow. It is commonplace to note that the years flicker by faster as we age. Certainly a new year can have less impact when we have many more stacked behind us. I suspect the sameness of the later years also alters our reading of them. We settle into habits and the days have fewer distinctions to mark their passing. We slide forward on skids greased by routine.

Little wonder, then, that we have a keener sense of the endless centuries behind us as our expected lifetimes approach a century. To a baby, a year is like a lifetime because it is his lifetime, so far. By age ten, clocks tick on at an apparent rate ten times faster than the baby's sense; the next year is only a ten percent increase in his store of years. At fifty, time ticks on five times faster still. At a hundred, the differential rate is a hundred times the baby's.

Some poets have found this a blessing, as in Thomas Campbell's "The River of Life":

Heaven gives our years of fading strength
Indemnifying fleetness; And those of
youth, a seeming length, Proportion'd to their sweetness.

Imagine living to a thousand; then a year would have the impact of a few hours in a baby's life. To such a being, deep time is the proper scale.

In thinking of far antiquity, we cannot help but invoke our current assumptions. In the 1990s, historical analysis often assesses our past using current moral or ethical standards, a critical posture doomed to obsolescence as tastes change. Something broader and less bound up in the moment is needed.

Culture shapes our vision of the past, even grossly falsifying it. As well, memory is notoriously unreliable. Individual recollections of the past are easily and quickly shaped by others and after a while need have little bearing on the once lived events. Consider how many believe one or more of the conspiracy theories about the Kennedy assassination.

Deep time messages seek to counter this, consciously or not. We are often unaware of how antiquity influences us, for as we shall see, some signals across the abyss of deep time we do not even recognize as artificial.

Throughout history, most people -- as opposed to some institutions -- have never given thought to the morrow beyond their own grandchildren. We moderns have taken this to new heights. Yet attempts to affect distant generations appeared in early civilizations. As we shall see, we live in a world subtly altered by changes wrought before historical recording began.

Assurbanipal, king of Babylonia, Assyria, and Egypt in the 7th century B.C., amassed a vast library of stone tablets laboriously incised with the knowledge of the day. Today these comprise a useful trove for scholars. Assurbanipal was following the lead of his father, Esarhaddon, who buried cuneiform inscriptions in the foundation stones of monuments and buildings.

They obeyed an impulse common to virtually all cultures. Typically the practice springs from a class that feels it has accomplished much and has the resources to leave durable messages announcing this. The universality of this impulse is fundamentally positive and far-seeing, time-binding us with generations before and after our brief moment in the sun. Practiced over millennia but seldom noticed in the everyday rhythms of our lives, the desire to pass on messages gives us perspectives on the import of our own actions, seen against the long odyssey of our species.

There seems to us something fitting, elegant and deeply human in such gestures reaching across the abyss of time, a humbling acknowledgment that posterity is quite real and important to us. Yet such acceptance is oddly exalting, too.

Such sentiments readily emerge from contact with ancient monuments. More complex and ambiguous feelings come in the face of the oldest concerted attempts to leave creative records, the cave markings found principally in Europe.

Were the cave painters hoping to send some record of themselves down through deep time? As usual, we can only speculate; paintings seldom announce their intentions.

Many have sensed that the cave art did contain messages, but increasingly, after decades of warring theories, experts believe that we cannot understand the messages clearly because they are not aimed at us.

Most commonly, anthropologists believe the paintings had some magical purpose. Did showing spears or harpoons penetrating game ensure a good hunt? But such weapons appear seldom. There are even counter-examples, such as a scene from the "Dead Man's Shaft" in the famous Lascaux cave. A realistically pictured bison is goring a man, who is childishly drawn. The bison is also wounded, impaled by a spear, its intestines protruding. Was this detail considered important enough to chronicle with care? Then why is the man crudely done?

Others believe that the paintings are art for art's sake, period. Since some

anthropologists believe these people had plenty to eat and leisure time, this seems plausible. Though the work ranges from bare, artless graffiti to stunning depictions, they all share a precision of observation. These artists knew animal behavior and fauna down to small details, and rendered them exquisitely.

This suggests that many paintings may have aided instruction of the young. Gathered safely inside, by fireglow young boys and girls could learn how animals gave away their movements and moods and methods. Some paintings begin near cave entrances and then fade toward the sunlight, erased by time, suggesting that they continued outside. Given the ease and pleasures of working outside, we can guess that Ice Age humanity may have left innumerable works on rocks, trees and boulders, of which a tiny fraction have come down to us.

Crucially, we cannot know if they had any sense of long time scales, or any urge to leave their mark for the shadowy far future. But the impact of their message, whether intended for their children or as art for art's sake, shines through. These very ambiguities make us study their works all the more.

Time breeds mystery, no less than the vastness of space. My next column shall explore how little we learn from even the best preserved monuments, and why.

Portions of this appear in Dr. Benford's new book, *Deep Time*.