Environment

The Aztec Solution

Michael Kile

Climate modelling of new data from the Aztec *Codex Cihuacoatl* has identified a relationship with important implications for global warming mitigation. The research suggests a strong causal pathway exists between climate change and Aztec rituals of "nourishing the gods" with blood sacrifice.

The evidence supports a revival of (humane) human sacrifice (HHS) as a mechanism for retarding environmental degradation and reducing dangerous climate change. HHS also would improve crop yields by allowing more effective control of surface temperature and rainfall; create anthropogenic biochar for soil enhancement and long-term carbon enrichment, especially in tropical environments with low-carbon sequestration capacity and depleted ferrasol and acrisol zones; and reduce population growth rates as the Earth's carrying capacity comes under further pressure this century.

Aztec culture has attracted scrutiny ever since Hernan Cortéz and his conquistadors entered King Montezuma's palace in the lagoon city of Tenochtitlan (now Mexico City) on November 8, 1519, triggering the destruction of an entire civilisation in only two years.

There has been, however, no investigation into whether Aztec sacrificial rituals might have influenced climate change in Middle America. Did they affect regional temperature and rainfall patterns? Did they improve crop yields in ways unknown to modern science?

Recent research by Mexico's Institute Nacional de Antropologia e Historia and international climate experts is producing new data that could answer these controversial questions. But why has the subject been neglected for over half a century?

First, cultural sensitivities and entrenched superstition discouraged study of Aztec human sacrifice. Second, there was a lack of evidence. While pictorial codices and other accounts of Aztec society exist, it took the sensational rediscovery last year of missing sections of the *Codex Cihuacoatl* (*circa* 1520) to revive academic interest.

Third, climate research has been refining its knowledge over the past two decades. The World Climate Research Programme (WCRP)—and its Climate Variability and Predictability (CLIVAR) model—only recently acquired the capacity to "simulate and project climate with unprecedented accuracy"[1]. With CLIVAR, reconstruction of past Middle American climates with greater precision has been possible. It has allowed complex time series simulation and use of eclectic proxies for temperature and other variables where empirical data is lacking.

The new *Codex* evidence is reviewed here with reference to Aztec cosmology, sacrificial rituals, sacred *tonalamatl* (divinatory) calendars, CLIVAR modelling and Mexico's mammoth discoveries. Implications for global warming mitigation are discussed and recommendations made for the urgent attention of international agencies and governments.

Tenochtitlan

When the Spanish conquistadors arrived in the Valley of Mexico in 1519, they saw Mexico-Tenochtitlan, the capital of the Aztec empire, rising out of an immense lagoon known as Metzliapan, or "lake of the moon". (Mexico means "in the middle of the lake of the moon".)

At its centre was the *coatepantli*, a cluster of monumental buildings dedicated to deities Aztecs

believed controlled climate, weather and their fate. It was dominated by the *teocalli*, a thirty-metre-high flat-topped pyramid with two sanctuaries on top. One was for Tlaloc, god of rain and fertility; the other for Huitzilopochtli, god of the sun and strife.

Facing the Great Teocalli was the temple of Echecatl, god of winds. The adjacent courtyard was used for *tlachtli*, a ritual ball game where the ball symbolised the sun. On the right was the Tzompantli ("hairy skulls"), a huge rack displaying skulls of sacrificial victims. (Cortez's companions counted 136,000 of them.)

Sacred Sacrifice

Aztecs believed their cultural continuity depended on sacrifice: "All life exists because of the gods. Their sacrifices gave us life and sustenance. We must repay them through sacrifice." Central to their apocalyptic worldview was a sense of sacred obligation, possibly similar to our concern for the environment. The Aztec word for debt repayment, *nextlahualli*, was also a metaphor for human sacrifice. Without constant sacrifices the Aztecs believed the sun would become "angry", temperatures would rise, corn yields decline and their world would be threatened with imminent destruction.

All life had an animating spirit or *tonalli*. Everything was *tonacayotl*, a manifestation of the gods. Everything came from them. Human blood hosted *tonalli*, hence there was an insatiable divine "hunger for the heart" of sacrificial victims.

According to *Bernardino de Sahagun (1540–85),* victims were taken to the top of a *teocalli* and laid on a stone slab. The abdomen was sliced open with a ceremonial flint knife. The still-beating heart was pulled out by priests. It was placed in a bowl held by a statue of the honoured god and the body was thrown down the temple stairs. The Aztecs sacrificed 80,400 prisoners in just four days during their 1487 re-consecration of Tenochtitlan's Great Teocalli.

Cortéz (1523) described a typical sacrifice in his *Letters*:

> *They have a most horrid and abominable custom which truly ought to be punished and which until now we have seen in no other part, and this is that, whenever they wish to ask something of the idols, in order that their plea may find more acceptance, they take many girls and boys and even adults, and in the presence of these idols they open their chests while they are still alive and take out their hearts and entrails and burn them before the idols, offering the smoke as sacrifice. Some of us have seen this, and they say it is the most terrible and frightful thing they have ever witnessed.*[2]

Sacrifices were made on specific days. There were eighteen festivities annually, one for each Aztec month. Sacrifices were made at all of them. Each god required a different kind of victim: young women were drowned for Xilonen; children were sacrificed to Tláloc; Nahuatl-speaking prisoners to Huitzilopochtli, and so on.

Aztec ritual revolved around both agricultural and sacred calendars: a 365-day *xiuhpohualli* (year count) agricultural cycle based on the sun; and a 260-day *tonalpohualli* (day count) ritual cycle. The two cycles formed a fifty-two-year "century", which was to them literally a life cycle. Because of the fear that all order would collapse without appropriate rituals, the end of each "century" required a huge New Fire ceremony. Many human sacrifices had to be made to ensure the sun's reappearance the next morning.

Attempts have been made to explain the prevalence of human sacrifice in Middle America. Sacrificial ceremonies clearly had important political and religious functions. Aztecs used them as a deterrent against enemies. Fallen conquistadors were often sacrificed, sometimes skinned alive, their heads placed in the Tzompantli.

Some scholars argue cannibalism was the main driver. For them, the aristocracy valued human flesh as a source of protein and merely designed rituals to validate this habit. For others, such as Lloyd deMause, the urge to sacrifice was an unconscious response to "traumatogenic modes of childrearing".

The new *Codex* evidence, however, suggests another rationale for such a pervasive ritual. Human sacrifice was an ancient mitigation strategy to neutralise the threat of dangerous climate change and risks of rising temperature, declining precipitation and poor crop yields.

Codex Cihuacoatl

The *Codex Cihuacoatl*, also known as *Codex Borbonicus*, is held at the Bibliothèque de l'Assemblée Nationale in Paris, which now occupies the original Palais Bourbon. Named after the goddess Cihuacoatl, it was written by Aztec priests shortly before the Spanish invasion.

Cihuacoatl ("snake woman") was an Aztec motherhood and fertility goddess. She helped Quetzalcoatl ("feathered serpent"), the sky and creator god, to create humankind by grinding up bones from previous ages and mixing it with his blood. She is often shown as a fierce skull-faced old woman carrying spears and a shield.

The *Codex* is divided into three sections. The first section contains one of the most intricate surviving divinatory calendars (*tonalamatl*). The second shows (in order) the dates of the first days of each solar year in the fifty-two-year cycle. These days are correlated with Nine Lords of the Night. The third (now complete) section describes rituals, especially those at the New Fire ceremony marking the end of each cycle.

The *Codex* is a single 14.2-metre sheet of amatl "paper" with forty accordion-folded pages. Each page represents one of the twenty *trecena* (thirteen-day periods) in the *tonalpohualli* (260-day) year. Most of each page depicts a ruling deity or deities, with the remainder taken up with thirteen-day signs and thirteen other glyphs and deities. Aztec priests used these symbols to create horoscopes and divine the future. For example, the thirteenth trecena depicts the goddess Tlazolteotl. She is shown upper left wearing a flayed skin, giving birth to Cinteotl. The thirteen day-signs of this trecena are in a bottom row and begin with 1 (Earthquake), 2 (Flint/Knife), 3 (Rain), and so on.

Discovery of the *Codex*'s missing first and last two pages in 2008, together with a hitherto unknown part of the second section, in the French National Assembly Library archives, is now attracting international attention. There are two reasons for this interest. The rediscovered *trecena* contain the most comprehensive Aztec data set yet found. They detail annual sacrificial numbers over the entire empire and relate them to crop harvests—predominantly maize, wheat and barley. The data set extends over 300 years, from the Early to Late Post-Classic Period.

Second, the remarkable second section contains nine depictions of sacrificial rituals involving mammoths. It establishes for the first time that Aztec awareness of climate change and its relationship to solar irradiance extends much further back than previously thought, possibly several thousand years.

CLIVAR Modelling

Statistical climate reconstruction techniques using the CLIVAR model produced accurate temperature anomalies for Middle America and Valley of Mexico region for various time periods. Several independent proxy data sets, including the invaluable new *Codex* data on sacrificial frequencies and corn yield, were used to derive estimates of regional spatial temperature covariance patterns (corrected for atmospheric absorption) and amplitude changes in them through time. A modified principal component analysis technique was used to optimise this combination of spatial and temporal information. Verification statistics obtained from data subsets confirmed the validity of the CLIVAR reconstructions.

The reconstructions confirm, on the balance of probabilities, that the major forcing agent determining regional temperature anomalies was the frequency of human sacrifice. Cooler periods, for example, showed an impressive causal connectivity with (lagging) high sacrificial numbers. Sacrificial frequency also directly influenced local rainfall patterns and corn yields.

There were other intriguing outcomes too. For example, young male sacrifices were statistically the largest percentile and tended to drive cooler weather, while female sacrifice produced warmer weather. The meteorological outcomes of child and animal sacrifice were less clear, and probably masked by the adult groups.

Recent research by David Lobell and Christopher Field concluded that wheat, maize and barley yields decline with increased temperatures. Annual global temperatures have increased by about 0.04 degrees since 1980, with even larger changes in some regions. This has had a negative impact on crop yields and produced serious losses.

Mexico's Mammoths

It is not widely known that mammoth skeletons and artefacts were discovered in 1952 near Tepexpan, thirty kilometres north-east of Mexico City. According to Wormington's *Ancient Man in North America* (1957), the discovery "provided incontrovertible proof of the contemporaneity of men and mammoths in the Valley of Mexico". The Direccion de Prehistoria of the Institute Nacional de Antropologia e Historia identified the bones as those of imperial mammoths (*Mammuthus (archidiskodori) imperator Leidy*). They were imbedded in an Upper Pleistocene lake deposit of fine green mud. The formation was dated at between 7000 and 10,000 years by geological methods.

In mid-1954, the Direccion de Prehistoria excavated a second fossil mammoth of the same species nearby. There was evidence of butchering. The skull was smashed, probably to extract the brains. Many bones showed cuts and grooves made by stone tools. The inscriptions on them are the earliest known depictions of solar sacrifice. Their extinction, then, was not caused solely by habitat disruption due to rapid climate change at the Pleistocene Holocene transition. Human predation for sacrificial rites was important too.

David Nogués-Bravo and his team used mathematical modelling to examine the importance of each of these factors. They predicted climate and species distribution at different times—126,000, 42,000, 30,000, 21,000 and 6000 years ago—and performed temperature and rainfall simulations. The results suggest mammoths suffered a catastrophic loss of habitat, with the species 6000 years ago relegated to just 10 per cent of the habitat available 37,000 years earlier, when glaciers were at their peak.

In Nogués-Bravo's optimistic case for mammoth numbers 6000 years ago, humans would only have had to kill one mammoth each every three years to push the species to extinction. There was a marked increase in mammoth mortality rates through time. Mammoth sacrifices therefore also seem to have affected solar irradiance and modulated warming, at least until species extinction. From that point, however, the temperature rose rapidly, melting the vast North American ice sheet and raising sea level worldwide. The Aztecs, then, were continuing rites that had been practised for thousands of years.

Age of Sol

Human sacrifice is clearly a potent forcing agent in climate equilibration. Furthermore, analysis of the climate record suggests its decline has been a key driver of rising global temperatures. The Aztec (and other) priests were right. Only sacrifice will ensure humankind's survival.

Given this outcome, should there not be an independent review of the United Nations Intergovernmental Panel on Climate Change (IPCC) perspective? Are atmospheric carbon dioxide increases really the dominant forcing agent for global warming (IPCC, 2007, p. 136), with the main

contributor to human carbon dioxide emissions being fossil fuel combustion (IPCC, 2007, p. 512)? The review should assess whether other factors, such as global population growth, are important contributors to global warming.

Opposition to human sacrifice as a climate change mitigation strategy is possible. However, society is on the cusp of a paradigm shift. Excessive individualism is in decline. Neo-liberalism is under attack. There is growing recognition our fate is determined by mysterious events related to the Sun (Sol)—333,000 times more massive than Earth and just eight light-minutes away. The Age of Sol is dawning.

The eco-spirituality that led to the first Earth Day celebration in Stockholm on April 22, 1970, fortunately has deepened over the past three decades or so. Voluntary sacrifice is no longer seen as the macabre ritual of a barbaric culture. It is more dignified than it was 500 years ago too, due to advances in psychotherapy and therapeutic medicine. There is a place for it in Sol's pantheon. After all: "Greater love hath no man than this, that he lay down his life for his friends (and future generations). He shall gain everlasting life."

The threat of climate change is real. A long period of dangerous solar irradiance is inevitable without decisive action. Humankind has angered Sol for too long. The precautionary principle justifies reviving (humane) human sacrifice (HHS). It would be a wise exercise in risk management. To be climate-change-ready, national and global mitigation strategies should include HSS commitments, based on national population growth projections.

In Australia, the government should offer generous grants to HHS dependants; issue free (securitised) sacrificial credits to working families; create a new Order of the Bleeding Heart; and restructure the now redundant carbon emissions trading scheme as the Human Pollution Reduction Scheme. These initiatives would send a strong message to the world—and to all Cihuacoatl sceptics and Huitzilopochtli deniers—that this country is serious about climate change.

Michael Kile *is author of* ***No Room at Nature's Mighty Feast: Reflections on the Growth of Humankind****. He is also a Perth playwright.* *Grateful acknowledgement is made to Mexico's Institute Nacional de Antropologia e Historia, the Bibliothèque de l'Assemblée Nationale in Paris, and the World Climate Research Programme for research assistance.*

References:

American Society of Plant Biologists, 2008, "Maize (Corn) May Have Been Domesticated In Mexico As Early As 10,000 Years Ago." June 30, *ScienceDaily* [http://www.sciencedaily.com /releases/2008/06/080627163156.htm].

American Society of Plant Biologists, 2008, "Ancient Mexican Maize Varieties: Sequencing Of Ancient Corn Landraces To Ensure Genetic Diversity And Resources. June 28, *ScienceDaily* [http://www.sciencedaily.com /releases/2008/06/080626075534.htm].

Cortés, Hernán, 2005, (1523), Cartas de relación. México: Editorial Porrúa.

deMause, L, 2002, The Emotional Life of Nations. NY: Karnac.

Diaz del Castillo, B, 1963, (1632), The Conquest of New Spain. Penguin Classics, J M Cohen (trans.) (6th printing (1973) ed.). Harmondsworth, England: Penguin Books.

Harner, M, 1977, "The Ecological Basis for Aztec Sacrifice". American Ethnologist, 4 (1), 117–135.

Hassig, R, 2003, "El sacrificio y las guerras floridas". Arqueologia mexicana, XI, 47.

Hassig, R, 1988, Aztec Warfare: Imperial Expansion and Political Control. Norman: University of

Oklahoma Press.

Intergovernmental Panel on Climate Change (IPCC), 2007, Fourth Assessment Report.

Kile, M G, Montellano, X, & Borges, J L, 2008, "Re-interpreting Codex Cihuacoatl: New Evidence for Climate Change Mitigation by Human Sacrifice." *Ancient Mesoamercia*, 19(4) 225-265.

Kile, M G, 1995, No Room at Nature's Mighty Feast: Reflections on the Growth of Humankind. Demos Press [http://www.popline.org/docs/1186/251527.html]

Lobell, D B, & Field, C B, 2007, "Global scale climate-crop yield relationships and the impacts of recent warming." *Environmental Resources*, Letters, 2.

Nogués-Bravo D, Rodríguez J, Hortal J, Batra P, Araújo MB, 2008, Climate change, humans, and the extinction of the woolly mammoth. *PLoS Biol* 6(4): e79. doi:10. 1371/journal.pbio.0060079. [http://www.sciencedaily.com/releases/2008/03/080331223843.htm.]

Ortiz De Montellano, B R, 1983, "Counting Skulls: Comment on the Aztec Cannibalism Theory of Harner-Harris". American Anthropologist, New Series, 85(2), 403–406.

Penn State, 2006, Early Americans Faced Rapid Late Pleistocene Climate Change And Chaotic Environments. *ScienceDaily*, February 21, [http://www.sciencedaily.com/releases/2006/02/060221090316.htm.]

Reilly J, *et al,* 1996, "Agriculture in a changing climate: impacts and adaptations." *Impacts, Adaptations and Mitigation of climate Change, Contribution of Working Group II to the 2nd Assessment Report of the IPCC* ed R T Watson, M C Zinyowera and R H Moss (London: Cambridge University Press) p 878.

Sahagun, Bernardino de, (1950–82) [ca. 1540–85]. Florentine Codex: General History of the Things of New Spain. Vols. I-XII. Charles E Dibble & Arthur J O Anderson (eds., trans., notes and illus.) (translation of Historia General de las Cosas de la Nueva España ed.). Santa Fe, NM and Salt Lake City:School for American Research and the University of Utah Press.

Sahagun, Bernardino de, 2006, *Historia General de las Cosas de la Nueva España*, ed. a cargo de Ángel Ma. Garibay (México: Editorial Porrúa, 2006), chapters XX to XXXVIII.

Wormington, H M, 1957, *Ancient Man in North America.* (4th edition) From Denver Museum of Natural History Archives (item 11414), www.archives.org.

---

[1] The World Climate Research Programme is a global research group sponsored by the International Council for Science, World Meteorological Organization and Intergovernmental Oceanographic Commission. The WCRP's objectives are *to determine climate predictability and the effect of human activity on climate* for the UN Framework Convention on Climate Change.

[2]*Cortés, Hernán, 2005, (1523), p. 26. "Y tienen otra cosa horrible y abominable y digna de ser punida que hasta hoy no habíamos visto en ninguna parte, y es que todas las veces que alguna cosa quieren pedir a sus ídolos para que más acepten su petición, toman muchas niñas y niños y aun hombre y mujeres de mayor edad, y en presencia de aquellos ídolos los abren vivos por los pechos y les sacan el corazón y las entrañas, y queman las dichas entrañas y corazones delante de los ídolos, y ofreciéndolos en sacrificio aquel humo. Esto habemos visto algunos de nosotros, y los que lo han visto dicen que es la más cruda y espantosa cosa de ver que jamás han visto".*