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An Ecological Research Project Collaboration

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2027: Waking the AKU
A Cosmic Hyperobject View of the Ancient Giant Palm Forest on Rapa Nui

Summary

Can a repeating climate event be termed as a cosmic hyperobject? Even if it is dynamically changing within hundreds of thousands of years? At the center of this paper is the science: observable data, 15,000 years of climate change on Rapa Nui. Reaching into the past however we begin with a much broader mathematical view from the eyes of Milankovitch theories of the cosmos that stretches a million years or more. Narrowing down from the cosmos to the atmosphere and into the biosphere landing onto a tiny island in the South Pacific Ocean we find the hyperobject in focus, a grandiose forest covering the landscape with what was the largest living and breathing giant palms ever known on earth. The water that is contained within the roots, stems and leaves of 16 million giant palms, is an enormous watery energy that was the life breath of this ancient island. As all hyperobjects are expected to be interwoven, this paper will move through time, following the storyline of adaptation and a changing culture view. Stepping out into the future it is now Twenty-Twenty-Seven, the projected return of a long term climate event that changed the island and these trees forever. To the Rapa Nui people, this AKU, an invisible interactive entity is perhaps what we call today the Hyperobject. Can an awakening of an Aku of the past still contain the resilience needed to sustain through the returning climate event of 2027?

Part One: Ice Ages explained through the Planet's Insolation

Ice Ages are those discrete climate events that bring great change. We are now better scientists in understanding the preemptive returns of these events that are especially linked to the rotation of planet earth in symphony with the sun and the other planets in our galaxy. Our lives literally revolve around cycles: series of events that are repeated regularly in the same order. Some are natural, such as the change of the seasons, annual animal migrations or the circadian rhythms that govern our sleep patterns. Others are human-produced, like growing and harvesting crops, musical rhythms or economic cycles.

Long ago, there were many that speculated how our planetary system worked, however it was the mathematician Milutin Milankovitch that found the keys and wrote them down. A century ago, Serbian scientist Milankovitch hypothesized that the long-term collective effects of the changing position of the Earth to the Sun is a strong driver of Earth's ***long-term*** climate, and are responsible for triggering the beginning and end of glaciation periods (Ice Ages).

Specifically, he examined how variations in three types of Earth orbital movements affect how much solar radiation (insolation) reaches the top of Earth's atmosphere as well as where the insolation reaches. These cyclical orbital movements, which became known as the Milankovitch cycles, cause variations of up to 25 percent in the amount of incoming insolation at Earth's mid-latitudes (between 30 and 60 degrees north and south of the equator) (figure 1).

The Milankovitch cycles include:

1. The shape of Earth's orbit, known as **eccentricity**;
2. The angle of Earth's axis tilted with respect to Earth's orbital plane, known as **obliquity**;
3. The direction of which the Earth's axis of rotation is pointed, known as **precession**.

Eccentricity is defined as the Earth's annual rotation around the Sun. Over time, the pull of gravity from our solar system's two largest gas giant planets, Jupiter and Saturn, cause the shape of Earth's orbit to vary from nearly circular to slightly elliptical. Eccentricity measures how much the shape of Earth's orbit departs from a perfect circle. These variations affect the distance between Earth and the Sun.

Eccentricity is the reason why our seasons are slightly different lengths, with summers in the Northern Hemisphere currently about 4.5 days longer than winters, and spring about three days longer than autumn. As eccentricity decreases, the length of our seasons gradually even out.

The difference in the distance between Earth's closest approach to the Sun (known as perihelion), which occurs on or about January 3 each year, and its farthest departure from the Sun (known as aphelion) on or about July 4, is currently about 5.1 million kilometers (about 3.2 million miles), a variation of 3.4 percent. That means each January, about 6.8 percent more incoming solar radiation reaches Earth than it does each July.

Obliquity is the angle of the Earth's axis of rotation tilt as it travels around the Sun. Obliquity is why Earth has seasons. Over the last million years, Earth's tilt has varied between 22.1 and 24.5

degrees with respect to its orbital plane. The greater Earth's axial tilt angle, the more extreme our seasons are, as each hemisphere receives more solar radiation during its summer, when the hemisphere is tilted toward the Sun, and less during winter, when it is tilted away. Larger tilt angles favor periods of deglaciation (the melting and retreat of glaciers and ice sheets). These effects aren't uniform globally however -- higher latitudes receive a larger change in total solar radiation than areas closer to the equator.

Earth's axis is currently tilted 23.4 degrees, or about half way between its extremes, and this angle is very slowly decreasing in a cycle that spans about 41,000 years. It was last at its maximum tilt about 10,000 years ago and will reach its minimum tilt about 10,000 years from now. As obliquity decreases, it gradually helps make our seasons milder, resulting in increasingly warmer winters, and cooler summers that gradually, over time, allow snow and ice at high latitudes to build up into large ice sheets. As ice cover increases, it reflects more (Albedo increases) of the Sun's energy back into space, promoting even further cooling.

Milankovitch assumed changes in radiation at some latitudes and in some seasons are more important than others to the growth and retreat of ice sheets. In addition, it was his belief that obliquity was the most important of the three cycles for climate, because it affects the amount of insolation in Earth's northern high-latitude regions during summer. He calculated that Ice Ages occur approximately every 41,000 years. Subsequent research has confirmed his findings.

Precession is the Earth's wobbling rotation. It wobbles slightly upon its axis, like a slightly off-center spinning toy top. This wobble is due to tidal forces caused by the gravitational influences of the Sun and Moon that cause Earth to bulge at the equator. The trend in the direction of this wobble relative to the fixed positions of stars is known as *axial precession*. The cycle of axial precession spans about 25,770 years.

Axial precession makes seasonal contrasts more extreme in one hemisphere and less extreme in the other. Currently perihelion occurs during winter in the Northern Hemisphere and in summer in the Southern Hemisphere. This makes Southern Hemisphere summers hotter and moderates Northern Hemisphere seasonal variations. But in about 13,000 years, axial precession will cause these conditions to flip, with the Northern Hemisphere seeing more extremes in solar radiation and the Southern Hemisphere experiencing more moderate seasonal variations.

Precession does affect seasonal timing relative to Earth's closest/farthest points around the Sun. Today Earth's North Stars are Polaris and Polaris Australis, but a couple of thousand years ago, they were Kochab and Pherkad, known as the twin pole stars or Guardians of the Pole. The Earth's axis wobbles, and it takes 26,000 years to complete one orbital wobble. As the axis wobbles, the star that marks the North Celestial Pole changes.

There's also *apsidal precession*. Not only does Earth wobble on its rotational axis, but Earth's entire orbital ellipse —that is, the oval-shaped path Earth follows in its orbit around the Sun — also wobbles irregularly, primarily due to its interactions with Jupiter and Saturn. The cycle of apsidal precession spans about 112,000 years.

In *De Natura Deorum,* Cicero wrote:

"On the diverse motions of the planets the mathematicians have based what they call the Great Year, which is completed when the sun, moon and five planets having all finished their courses have returned to the same positions relative to one another." Josephus (first century AD) refers to a 'Great Year' of 600 years. It has been suggested that he obtained this value from Berossos (c. 3rd century BC) who stated that climate time moved in intervals of 60, 600 and 3600 years. Isaac Newton (1642 – 1726) determined the cause of precession and established the rate of precession at 1 degree per 72 years. "*Those on the other hand who said that the world is itself endowed with life and with wisdom, failed entirely to discern what shape the nature of an intelligent living being could conceivably possess." (Cicero,p.10)* All of these intervals will be revisited in the next chapter as observed data directly aligned with the cores from Rano Kao.

In 1976, a study in the journal **Science** by Hays et al. using deep-sea sediment cores found that Milankovitch cycles correspond with periods of major climate change over the past 450,000 years, with Ice Ages occurring when Earth was undergoing different stages of orbital variation. In the cores from Rano Kao on Rapa Nui that were retrieved by the author in 2005, 2008 and 2014, show cyclical changes discovered through oxygen isotope analysis that also align with the Milankovitch cycles. These cores are the basis of the next chapter's more detailed look at these climate events over the last 15,000 years and the upcoming event beginning around 2027.

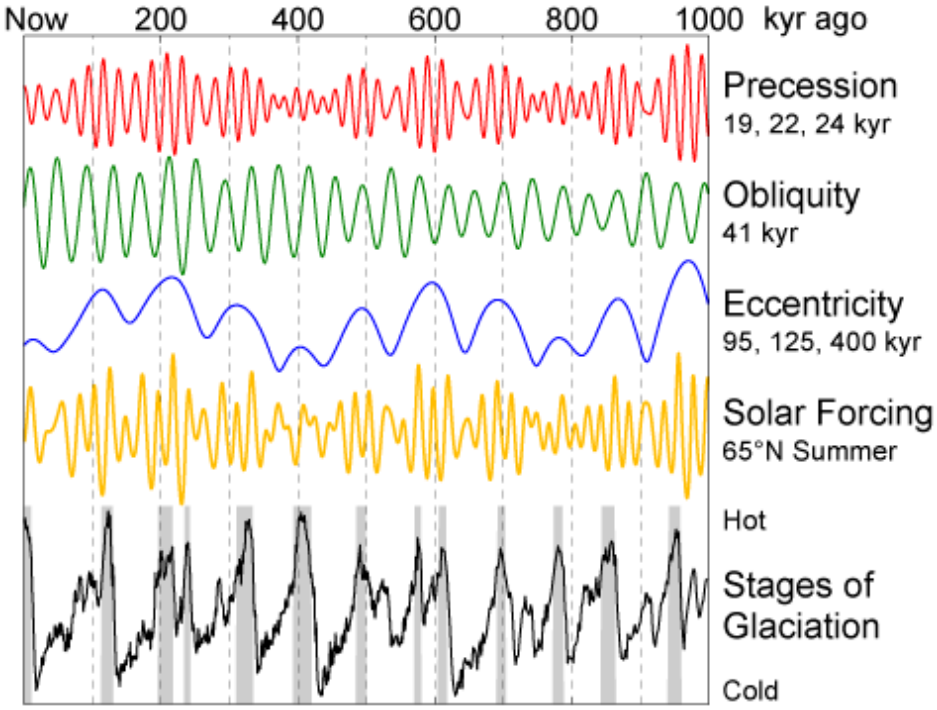


Figure 1. Shows the variations in Earth's orbit, the resulting changes in solar energy flux at high latitude, and the observed glacial cycles. According to Milankovitch Theory. Courtesy of Wikipedia Common.

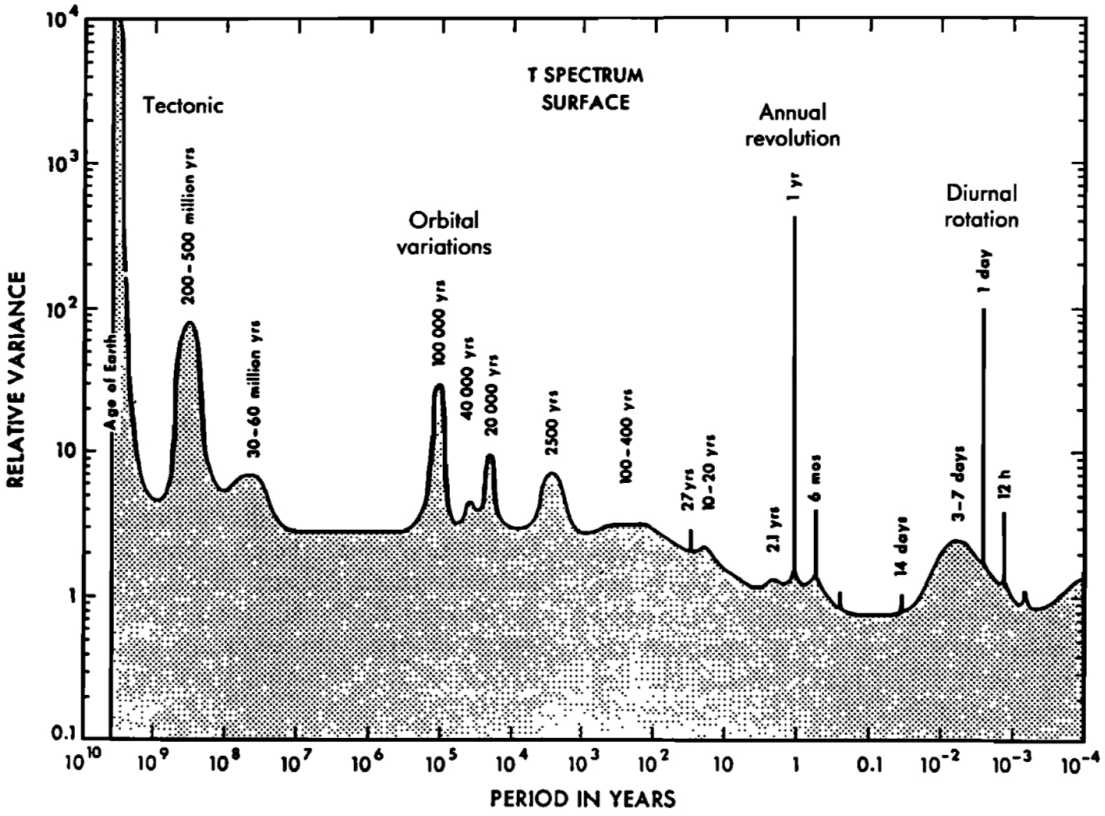


Fig. 2. Tentative spectrum of climatic variations. Estimate of relative variance of climate over all periods of variation. A background level of variability, deriving from internal stochastic mechanisms and corresponding to a low degree of predictability, appears to increase in amplitude toward the longer time scales and to be overlaid by band-limited variability, due to external forcing processes and corresponding to a high degree of predictability (adapted from Mitchell [1976]).

Part Two: Rapa Nui paleoclimate

Oxygen Isotopes - Evidence of Climate Change over the last 15,000 years

After the unnamed solo volcano grew up from the depths of the Pacific floor for a million years, it exploded, then cratered and formed what is now called Rano Kao. Some 300,000 years ago this basin then began collecting rainfall. Over time a lake formed and supported a diverse ecosystem of trees, shrubs, ferns, grass, birds, animals, insects and eventually humans. Rano Kao has a unique microclimate, deep enough (250m rim to lake surface) to be sheltered from the ravaging winds that frequent the island yet subject to intense solar radiation. Slowly the lake releases its moisture, evaporating and supporting its thriving plant ecology. Thousands of years of extremes between drought and bogginess, a matted cover of plants threaded their roots and stems across the basin when the lake became devoid of water around 3500 years ago. A climate shift eventually brought more rain, cooler weather and less evaporation. With more rainfall, rising water levels lifted the thick mat of plants from its boggy surface around 2000 years ago. The floating mat is 2-4 meters deep which is now a floating peat bog with its own unique ecosystem within the Rano Kao microclimate.

Introduction to Cellulose Isotope Studies

Lake sediments are useful in advancing our understanding of ancient environments. Trapped within the sediment deposits are carbon and oxygen isotopes from the decaying aquatic plants and consequently the lake sediment cellulose can provide a record of the lake's paleo-hydrology. As the lake levels change with rainfall input and evaporation, the lake water history is captured within the cellulose of these plants.

In 2005 the 9 meter KAO3 cores were comprised mostly of 15,000 years of decomposed detritus from the aquatic plants known as Tavari (*polygonum acuminatum)* and the scirpus Totora (*Schoenoplectus californicus*). The scientific data comparing Oxygen16 (O16) which is lighter than the heavier Oxygen18 (O18) results in a $d^{18}Olw$ signal in the lake sediment cellulose. More evaporation and there will be a loss of the lighter oxygen isotope, more rain and the heavier isotope is more abundant. These reflect changes in climate. The signal also reflects a change in rainfall, temperature, solar conditions and wind, but the isotope analysis alone cannot differentiate cause and effect; the pollen and ecology portion of this research is critical to support the climate data revealed in the isotope analysis.

How then does an ecologist discover the range of tolerance and environmental preferences between aquatic and terrestrial plants that are both inside and outside of a volcanic crater? That was a special challenge for this research as more than 40 trees and plants discovered as fossil pollen in the core no longer exist on the island. Many of these plants were endemic and are now extinct. Being left with only the remnants and fossils in the lake sediments, they were used nonetheless to date, test and reflect upon what kind of environment and life existed on the island.

Teaming with Brent Wolfe and his grad students at Wilfrid Laurier University, sediment samples from Rano Kao were used for the lake water oxygen isotope analysis. Reconstructing a rainfall and drought profile over the last 15,000 years (figure 3). You will note 8 significant events where such extreme depletions (to the left on the graph) and enrichments of O^{18} (to the right) would have changed the ecology of the island in drastic ways. The significant findings found in these cores and data were repeating long term climate cycles. Every 637 years a depletion event was noted, meaning that during these events the island became cold and sometimes very dry and rainfall was scarce. In opposition when O^{18} peaked we see hot-dry events bringing extreme events every 719 years. According to the Milankovitch theory, around 9,000 years ago, the Earth experienced a peak in the "Holocene Climatic Optimum," which means it received the maximum amount of solar radiation in the Northern Hemisphere summer due to the alignment of Earth's orbital parameters, leading to a period of relatively warm global climate; this is considered a significant "Milankovitch event" as it represents a high point in the current interglacial period. In the Rano Kao cores the hottest event in the cores occurred at a C14 date 9,274 years ago, dipped with wetter conditions for a few years then in 9,241 began a strong cooling trend quickly dropping to a major cold event. Current trends in the lake now show that moisture is increasingly evaporating with warmer temperatures, however the long term underlying trend over the last 9,250 years show a cooling trend, as also found similar to the trends in Lake Titicaca (personal conversation, Dunbar et al).

When looking back on Milankovitch's mathematical equations, and the periodic cyclic changes, the data from Rano Kao is almost exactly aligned. In a cultural perspective, the data we find now did not exist in the ancient world of the Rapa Nui, however the cultural wisdoms of the world were well aware and made their own existence depending on these predictable returning events. What really happened to the trees on Rapa Nui has up until this point been speculated upon and continues yet to be allegory until now.

A Short History

In 2005, 2008 and 2014 I cored the crater lakes of Rapa Nui in search of answers to the question, What really happened to the trees? Challenging the theory that humans had cut them all down to move the moai around the island, I wanted to know if something else like a climate event, or disease, or some ecological other was responsible for 16 million of the planet's largest palm trees to disappear. It's a very plausible idea that humans could have cut them all down since we see deforestation all around the world. To have cut these trees it would have taken 800 years at losing 55 trees per day continuously. However you will learn that these giant palms are reservoirs of water, moving billions of gallons of water from the deep tap roots in the soil through the massive stems respirating through the leaves some 30 meters (90ft) above the horizon. The Rapa Nui palm is not a normal tree.

The long-ago history of the island and the memory of the giant palms have been lost due to unfortunate human circumstances. Slave stealing tore away more than a thousand Rapa Nui including the last King and the holders of the oral knowledge of their culture. The remaining islanders died of disease. In 1888, there were only 111 islanders left to continue into a better known historical story. The story of the trees are left to 2 petroglyphs carved into rock less than 5 symbols noted in the *rongo rongo* tablets which show a palm tree. There is no Rapa Nui name for these palms. The *Sophora toromiro* however is a native tree that has existed over the last 15,000 years on the island, the last of which died in 1960 in the crater of Rano Kao. The folk lore states that a sacred tree would have been planted next to an ahu, ceremonial platform, and then called Toromiro regardless of its species. To the Rapa Nui people, a tree and the ceremonial platforms, ahus, were both sacred before the Moai were placed upon them.

William Liller, an astronomer with the Institute Isaac Newton in Santiago Chile, conducted extensive studies during the 1980s and 90s on the alignments of the more than 300 Ahus found on the island. William Mulloy in 1965 systematically measured the coastal ahus for celestial orientations and found that out of the 226 ahu measured, only 45 had possible significant alignments and these were marking a true (astronomical) north or east-west axis. Mulloy never published these records and Liller picked off where he had laid down the investigation with looking inward to the non-coastal moai. Liller found that more than 25% of the remaining ahu did align with a solstice, equinox or celestial event. His conclusions were that the inland ahus were important for agricultural reasons in marking the beginning of seasons. (Liller, 1993)

During my fieldwork in 2014 I had been aware that 3 comets had come and had been witnessed on the island, and I would be present for the Autumnal Equinox in March. I went to the Timekeeper, the noted solar observatory Ahu Huri A Urenga. This ahu is situated between Puna Pao (the red scoria quarry used for the topknots of the moai) and Maunga Orito (the obsidian

quarry), both of which are three kilometers from the modern town of Hangaroa. Huri A Urenga has a large ceremonial platform with a single moai on a twisted platform at 20 degrees from the perpendicular walls. Mulloy and Liller both noted a direct alignment to the June (winter) solstice sun. Another confirmation of Mauna Mataengo ("Mount Tear-stained Eye") lay on a line pointing precisely in the same direction for sunrise, and a nearby point on another hill marked the setting sun. Outside the wall of the ceremonial platform, 5 pairs of cupules lay under the grass that aligned to three solar significant rising points and true north.

In the timeline of architectural construction on the island, the ahus came first. It was later in time that the moai were created and placed upon them changing the ceremonial ahus to ancient elder worship. Huri A. Urenga is unique in that he is the only moai with two sets of hands. I have heard the speculation made that the carvers made a mistake on the first set of hands and rather than rebuild the moai, they carved out a second set of hands. Given the highly skilled moai builders and the great effort to move these moai to their places, I began searching for the significance and meaning of two hands. During the morning of the Equinox, I watched the Southern Cross due south from the platform walls and the moai. As the sun began to rise it cleared a small hill and speckled light shifted through the now grove of trees blocking the connection between sunrise and Huri. In the past these trees would have been cleared and the sunrise would have entered at the foot of the platform and slowly creeping upward towards the face of Huri. Solar noon would have circled above his head and moved toward sunset upon his back. Huri's hands may indicate the movement of two seasons, both Autumnal and Vernal equinoxes. Perhaps it represents both male and female spirit. Huri A. Urenga as noted by Liller is also a significant in land winter solstice marker.

The significance of this unique solar marker has long been forgotten, as Huri A Urenga was laid down long ago until its resurrection in 1972. Names, just like places were lost and the folding in of this name is only a place marker today. However, looking back into meaning the Rapa Nui "A" means possession. There are only a few ahus that use this significant meaning, another is Ahu Moai A Mata Mea which means "belonging to the red (evil) eye," and "is the moai that belongs to the planet Mars " (Liller). For Huri A Urenga, Huri means "change" in Maori, with a meaning "possession or belonging to" and separating Ure Nga which is proper in the current language. In Maori the Kai Ure is the charm of healing from numerous ills, and Nga is the "upward motion." Huri A Urenga may have been the Timekeeper of the island, the place to reset time each season, to direct and find true north for celestial navigation, and to atone for ones sins and ask for healing for illnesses from the stars.

The cosmic sky was very alive during the time of the ancient Rapa Nui. Noted in the rongo rongo is the Red Star called "Pau." According to tradition, the astronomer-priests preserved the vital information of the stars, sun, moon, season changes and cosmic activity in oral expression as well as marked in the cupules, platforms, tablets and statues. Periodically the astronomers would climb the tupa (towers) to announce the changing positions of the stars for safe navigation and daily life. The red star Pau grouped with Matamea (Mars) and Tautoru were noted to be harbingers of trouble and danger. These were also cyclic and the knowledge of their appearance and return were critical. Matamea's return to the sky occurred every 780 days. Pau has been drawn onto the rongo rongo script as noted by Rjabchikov (1999). Pau may have been the returning Halley's comet, or the brightest star in the Earth's sky, Sirius with a noticeable red

shift, was the first star to have its velocity measured in 1968 by Sir William Huggins. During the heliacal rising of Sirius, namely the day it becomes visible just before sunrise after moving far enough away from the glare of the Sun, would have been in the shadow of the sun for 70 days. Its reappearance is noted in ancient Egypt to occur just before the annual flooding of the Nile and the summer solstice, which would have been the winter solstice for Rapa Nui. Due to its declination of roughly −17°, Sirius is a circumpolar star from latitudes south of 73° S. From the Southern Hemisphere in early July, Sirius can be seen in both the evening where it sets after the Sun, and in the morning where it rises before the Sun.The season following the star's heliacal rising (i.e. rising with the Sun) came to be known as the Dog Days of summer, bringing many places drought. Perhaps, the two sets of Huri's hands were the setting and rising of Sirius, and perhaps Ahu Huri A Ure Nga, "the moai that belongs to the healing star" could have been the most significant place on the island at one time.

In Rapa Nui folklore the celestial bodies and events were just as important as rainfall. When Jacob Roggeveen landed in 1722 their observations were that the Rapa Nui people "had prostrated themselves towards the rising sun." (Liller, 2003) They planted their food crops by phase of the moon, feared omens like Mars appearance in the sky, sought help for ailments, marked their daily calendars for ceremonies and events, and began their year shortly after Pleiades first appeared in the morning sky - or when the sun "rose farthest to the north." Katherine Routledge, during her year long stay on the island in 1914 wrote about the significance of the story of Orion: *"A certain married woman, on going down to bathe was carried off by a stranger. When her husband discovered this, he slew her in anger, and she fled up to be a star. The husband then took their two boys, one in each hand, and followed her to the sky where the three form the belt of Orion. The wife, however, would have nothing to do with them and remained in a separate pat of the heavens."*

These three stars, which rotate about the East and west points of the horizon were important for navigation as well as in the anticipation of Sirius. It is Pleiades, named *Matariki* in Rapa Nui, meaning "Eye of the King" whose first appearance in the early morning sky would mark the beginning of the new year.

During the AD700s the night sky became very alive with comets and eclipses. Halley's comet arrived in 760AD and then was followed with 5 major eclipses beginning in 762-772AD. This unusual activity could have brought upheaval on the island as all were watching. It is during this latter period that we first find significant charcoal in the sediment cores marking the beginning of the industrious time of the moai building. Over in North America the time period of 750AD the Late Woodland shifted to the Emergent Mississippian.

In 837AD Halleys returned soon after a solar eclipse and this time it was closer than all recordings in history of its passing. The ancient Rapa Nui would have seen a "broom star" as the Chinese have called it nearly directly overhead with a comet tail reaching 90degrees towards the horizon. In 880-900AD a great drought took hold of the world and then Halleys returned in 912AD.

In the journals of the Voyage of Discovery, 1,000 years later, Captain James Cook stated "...the Polynesians distinguish stars separately by name and know in what part of the heavens they will

appear in any of the months during which they are visible in their horizon; they also know the time of their annual appearing and disappearing with more precisions than will easily be believed by a European astronomer."

When the Rapa Nui were watching the skies intently during these active times, others around the world were doing the same and seemed to be inspired to erect temples, ceremonial platforms, celestial markers and sacred spaces to watch the stars above. In the Desert Southwest, the ancient pueblo dwellers began building towers and kivas. The culture produced specific identifying black and white geometric patterned pottery and etched solar markers into the rock nearby. The cosmic sky increased its activity and in 1006AD a supernova exploded and was marked around the world. In 1018 the Northern Luna Standstill was captured at Chimney Rock and on Rapa Nui a huge amount of charcoal was found in the sediment cores of Rano Kao.

Between 1000 and 1100 AD there were noted 241 solar eclipses and 246 lunar eclipses that would have been seen. Particularly in 1054AD a supernova became what is known as the Crab Nebula and it was marked high upon the walls near Pueblo Blanco at Chaco Canyon along with a broom star, a sign that they too were watching the cycles of the famous comet Halleys. Solar Architecture increased at Chaco Canyon, Hovenweep, Chimney Rock and Mesa Verde, while moai building on Rapa Nui became increasingly larger. Everything was intensifying. In 1050AD the Mississippian tradition exploded across the landscape and began building Woodhenges as solar ceremonial centers in Cahokia (Iseminger, 2010). These henges, built of red cedar continued into 1200AD.

In 1064AD Sunset Crater erupted in what is now Flagstaff, Arizona disrupting the Anasazi and pueblo dwellers. Halleys returned in 1066AD while European world was collapsing in the Battle of Hastings, meanwhile in 1076AD the great kivas of Chimney Rock were in full ceremony. In 1090AD another great drought set in which perhaps pushed Chaco Canyon to build the Great House 1093AD. In 1133AD a solar eclipse was noted and 1170AD Mars, known as Matamea stood in front of Jupiter and made quite a show, and then Sunset Crater erupted again in the desert southwest. Meanwhile in the time of the Classic Maya the hierarchy was breaking apart.

By the time of 1150AD great change was happening, people were moving into cliff dwellings at Mesa Verde, Chimney Rock had been abandoned, Chaco Canyon ceased to be a solar ceremonial center, the Classic Maya had already shifted into small bands, the ancient Anasazi were moving to the San Pedro River in small groups and on Rapa Nui the change was coming. Drastically altering the landscape in 1173AD, the charcoal record had a high incidence of charcoal which signified a great amount of burning, although the isotopes in the lake show a similar environment to our current rainfall and evaporation rates.

For the next sixty years on Rapa Nui however, a long term drought peaked in 1230AD with an extreme hot event lasting 10-20 years. Similar in time to the water fertility site at Ava Ranga Uka, a collapsed lava tube in the middle of the island of Rapa Nui. A place where during rainfall periods had great waterfalls and pools, and in drought one of the few places where water finds its way from both sides of the island down into this 8 kilometer creek to the sea. Down into what appears to be a ravine, is a multi-layered plaza under a single moai called Ahu Henua Nua Mea. This moai, perhaps the most inland found ahu, is directed towards the North, perhaps

toward the moon as it is she who is associated with fertility in humans, animals and plants of many cultures. Down below in the excavation are palm planting pits nearly 80cm in diameter. (Kuhlem, 2019). With a growth rate of 1cm per year, the ancient palms would have been nearing their first flowering session that takes nearly 100 years. These deliberate plantings may be some of the last standing palms in an attempt to save them, or use them in some reverence for this water site.

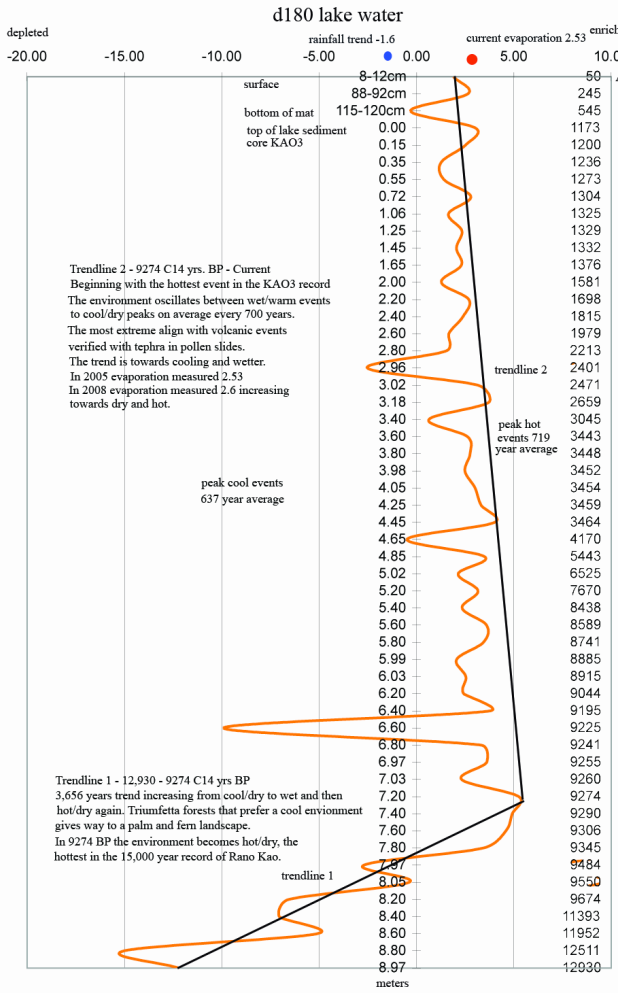
The Great Towers at Mesa Verde were erected during this time and around 1222AD Halleys made its reappearance. The Drought Panel at Fremont Indian State Park, the ancient village at Clear Creek Canyon, depicts a whole story on crumbling rock pillars about a great drought during this time period and the inward journey to the pit houses.

By the time 1300AD came about, most of these cultures were disbanding and abandoning the large ceremonial centers. In 1350AD in the cores at Rano Kao, the isotope record drops drastically which signifies a very cold event occurred, then shifting drastically to high evaporation within 40 years. It is this event beginning in 1390AD lasting 115 years that is the longest and most extreme cold event recorded in the lake sediments. By 1405 the fossil pollen had decreased drastically, and by 1456AD the giant palm trees were dormant. The nemesis for these trees is cold, they are full of sugar water with a vascular system liken to animals. These giant palms in their dormant mode began to die and did not produce new seed. This was the year Halleys returned into view. Even in Peru, Pachcuti expanded outward. In 1460AD a comet came to visit and brought with it a harbinger that would collapse most of these ancient cultures into small bands in search of water and shelter.

The isotope record of Rano Kao rainfall oscillates around a current normal over the last two-thousand years except for these drastic punctuated events, the last cold event peaking in 1456AD (figure 3). The periodic intervals between these cold events has been measured to occur every 637 years. Moving the calculation forward, the next expected cold event would begin roughly around 2027AD and may have already begun as my recent measurements of the lake water show two meters less with less evaporation than six years earlier.

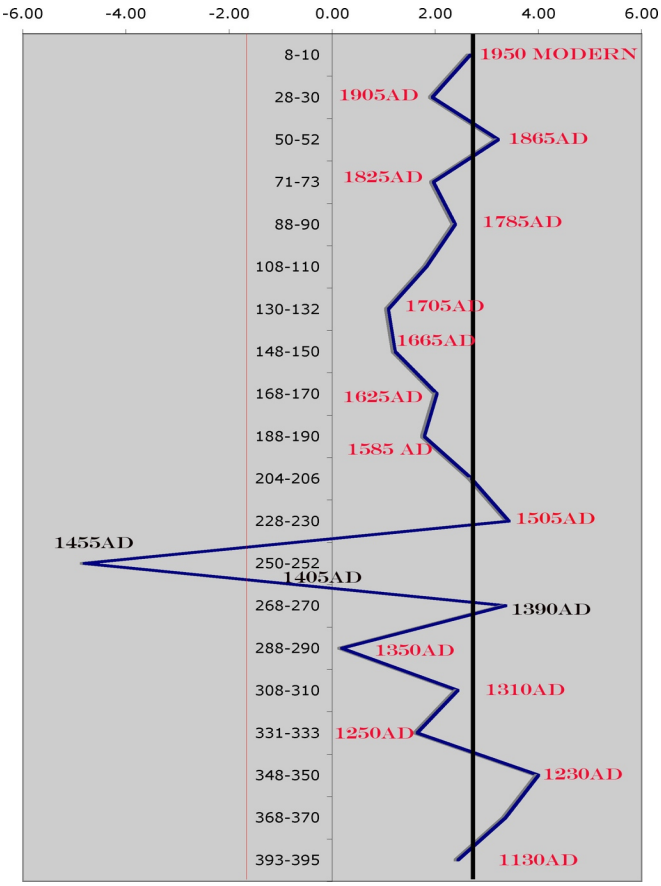
Comets, eclipses, lunar standstills, supernovas are all markers of cosmic events that we can see mirrored and reflected in the artifacts left behind in many cultures (figure 5). My own work has found similarities amongst the Anasazi, Mayan and Rapa Nui. Perhaps these coincidences are due to geographic location within 30degree north and south of the Equator relatively close in longitude and affected similarly by global climate events driven perhaps alongside these cosmic events. Observation shows that civilization has always watched the skies, and depended greatly on how climate shifted at the appearance or absence of certain stars. These cultures that I have observed including the Rapa Nui, the Anasazi, The Mississippian and Mayan for instance noted, marked and left behind great markers of these events if only we can pieces these patterns together. Matching these times periods with climate data collected from the lake sediments shines a new relationship between what was happening in the sky and how it affected earth and perhaps affected the stars in return. Ancient medicine from the gifts of Paracelsus, the Bon and nomads of the Asian Plateaus, the Dogon in Africa talk about the effects of stars on people, and how our perception of them is just a reflection of the workings within our own bodies. The microcosm becomes the macro and visa versa.

In 2021, we have found humanity in a pandemic, unexpected, but marked once again with a Christmas Star, where a conjunction between Saturn and Jupiter brightened the stars, bringing us all out into the night sky, to think about the last time this view happened was nearly 800 years ago, and does this now mark us into the history of global change?



Rano Kao KAO3 core Isotope graph

Figure 3 15,000 years Climate Events d18Olw



Bottom of 4 meter mat

Figure 4 The Mat d18Olw events.
Cold (L) Hot (R) Vertical Line-current Evaporation

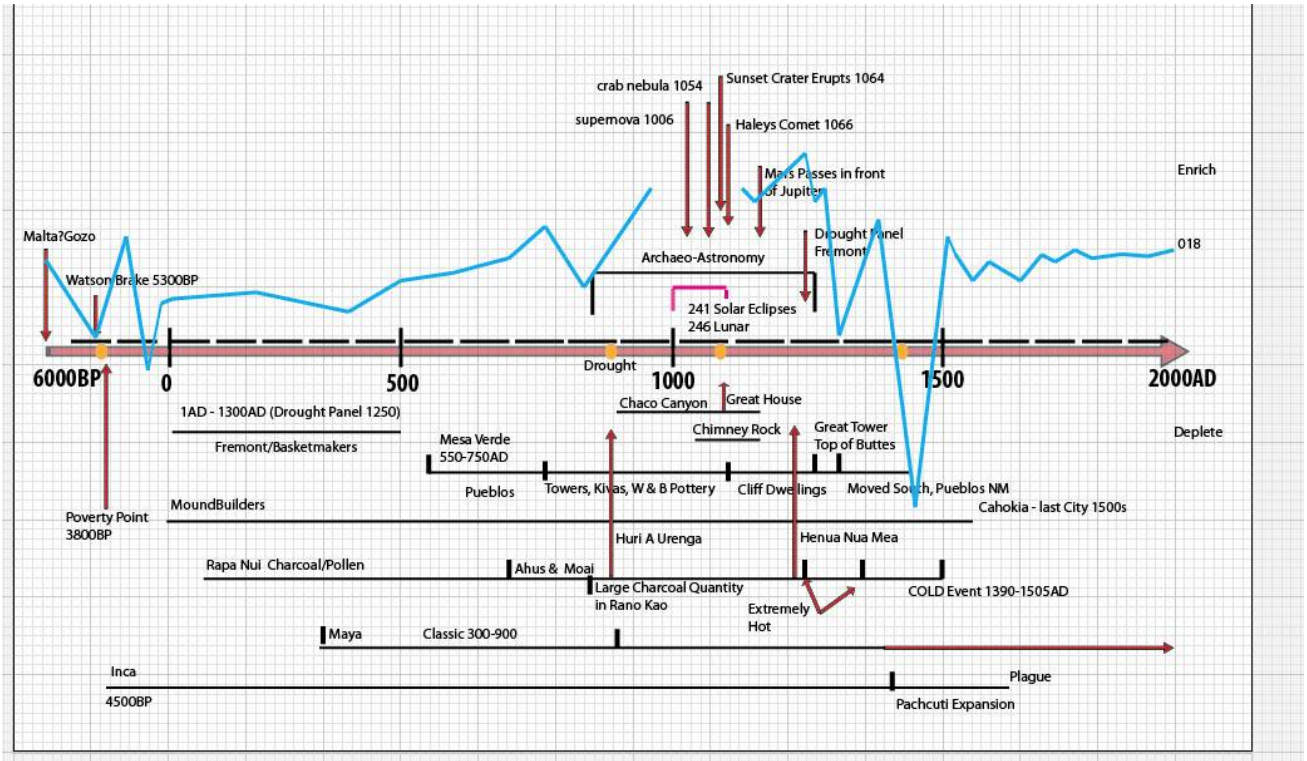


Figure 5 Timeline of d18Olw Rano Kao up is enriched (Hot), down is depleted (Cold), along with cultural timeline and cosmic events. Originally published in 2021, Cosmic Relationships.

Part Three: Hyperobject phases on Rapa Nui

Part Three of this paper focuses on water as a Hyperobject and takes a deeper view into the phases of water on Rapa Nui. Beneath the surface of the Pacific Ocean, there are rifts and sea mounts with lots of movement. Reaching high above the horizon appears an isolated island now called Easter Island. However this island is the makings of millions of years of volcanic activity deeply connected below. Standing on the volcanic coned grassy landscape, the view drops off at a mere 14 miles (22km) appearing surrounded by nothing but ocean. The early arrivers called their island “Te Pito O Te Henua” the navel of the world. These Polynesian travelers came a great distance to find the center of this watery world.

On the island landscape today there are no rivers or creeks, no running water at all. Rainfall sinks right into the volcanic soils and merge together in an aquifer beneath the surface. What the environment was like long ago has only been speculated upon until recent science and the coring of the crater lakes revealed how diverse the plant life really was. The Rapa Nui language tells that the islanders learned where more than 300 springs percolated above the soil and gave them place names called *vai* (water). There are three crater lakes on the island named Rano Kao, Rano Aroi and Rano Raraku. All have rich history where ceremonies were held and seasonal festivals were celebrated. The largest of the lakes is called Rano Kao, within the rim of a gaping mile wide circular volcanic crater where 2-6 billion gallons of tannin rich water penetrate 12.5 meters deep. The rainfall is the only water reaching inside this basin and it too has a name, called the *aqua dulce*, the sacred sweet water.

Above the horizon there were once 16 million giant palm trees each holding 60-70% water within their large 6' diameter stems that reached 90' feet into the sky. Between the roots, the stems and leaves, there was thousands of gallons of water in each tree moving between the roots and up and out of the leaves as they respirated 200 billion gallons of water every day. Above them, were the clouds, below was a vast vibrant and dynamic ocean. This system seeked isostatic equilibrium and for the people they also strived for a stable life amongst this great forest. Rainfall then came with dynamic force in storms, silent rainfall, evaporative clouds that floated above the lakes and percolated beneath the soil. It was held in the giant palms and the diverse plants that covered the landscape. This living landscape was the dynamic mover with cycles of change.

Morton

Timothy Morton, philosopher and author of *Dark Ecology*, is a core member of the Object-Oriented Ontology (OOO) philosophical movement founded in 1999. They propose a strongly anti-anthropocentric reinterpretation of our relationship with the world, objects, and hierarchies. Morton introduces new philosophical concepts such as "hyperobjects": objects so massively distributed in time and space as to be impossible to distinguish or detect directly, like the biosphere, gravity, the internet, climate change and global warming. For this paper I have taken the idea of paleoclimate cycles as he has written about the idea of *Hyperobjects. W*e consider what the qualities of a hyperobject are and if this idea is relevant to climate change and hyperobjects on the island of Rapa Nui.

1. A hyperobject is viscous, meaning it has a sticky consistency between solid and liquid; it is matter and tangible.
2. It is beyond human time scales, which makes understanding climate change a very difficult thing because it is hundreds and thousands of years to consider in comparison to our average life span as human in 75 years.
3. The hyperobject is non-local and widely distributed, as it could be global, or in the cosmos, or reaching beyond one or more cultures.
4. It is phased, cyclic, periodic, repeating.
5. It displays interobjectivity, where one or more objects have a feedback system, or act upon one another and apart of the other.

For the ocean that surrounds Rapa Nui, it seems timeless, vast, untouchable to infinity, but yet completely immerses and is centered by an individual view, and a collective view. Within this context, in the idea of hyperobjects, I speak first about the cosmos and how science has periodically realized through mathematics the dynamics of our planet Earth. These theories and observations over time find that climate events are cyclic, repeatable and with periodicity causing Ice Ages. Comparing these large cosmic definitions of time and energy, into the observation of data collected with a global eye from the volcanic crater lake Rano Kao on Rapa Nui we find correlation over the 15,000 year old climate profile recovered from sediment cores beneath the water of Rano Kao. In these cores are spiked events that cycle including of interest the cold events that repeat every 637 years and the hot events every 719 years. These events

carry within them the definition of hyperobjects as well as the respondents acting and reacting within these events, the giant palm forest living and breathing on Rapa Nui.

Climate event as Hyperobject

In time, over the long human history of planet earth, we have been observing, measuring, calculating and trying to understand the place we are born of. Many scientists find bits along the way and drive the desire further and further to also under the changes that happen over time. Our limit is that human knowledge is short as our life span pales in comparison to the cycles of the planets, the Milky Way galaxy and the cosmos we are connected to. The arguments are still holding between the age of the planet, whether flat or round, and what is changing climate whether natural or human caused. However there are many stories made of parts of information influenced by cultural seasons inside of nature. Science however and the absolute language of mathematics and physics bring us to the closest understanding of climate change.

Many years ago while studying ecological design I found the connection between earth and atmosphere written in the words of physicist W.O. Schumann. Schumann was not the first discoverer of resonance nor will he be the last scientist to test it, but he made the connections to understanding the human connection to planet earth through electromagnetic frequency. For so long humans have disconnected their beliefs from nature that in the evolution of those beliefs we have begun to destroy the very nature that makes us whole and healthy. We are not apart of the trees, or ocean, or atmosphere that we can affect and be affected by. For Schumann, he discovered that earths surface had a consistent electromagnetic frequency of 7.83hz. This frequency has spikes and events within its long constitution and can increase and decrease depending on the very essence of the energy that strikes the earth, lightening.

There are an average of 2,000 lightening strikes every second that maintain this consistent low frequency hertz. Change of this frequency relates to the number of lightening strikes that originate with energy entering the ionosphere and travel to the lithosphere, the land upon we find the gravity in our feet. The idea is as incoming solar radiation increases this causes more warming and consequently there will be more lightening strikes on the earths surface. More lightening strikes increases the frequency (EMFs) which in turn affects everything on this planet. Modern day scientists like Robert Balling have set up data observations to measure the changing EMFs and climate change written in his book *Satanic Gases.* He admittedly states that the changes are real, the frequency is increasing, more lightning strikes are observed, the planet is warming, but it is not caused by humans he states. Balling says climate change is natural. His research is in part one story within thousands of years of deciphering what really is happening out there as we call it, and affecting our home and us. It has been noted that with the intense rise of EMFs that our collective heart rates have increased, that blood pressure rises and many more biological functions change with EMF increase and decrease. What I found on my journey into building healthier houses made of earth was that this connection to earth really does keep us healthy.

As a scientist, I placed Schumann Resonance cycles, into patterns of climate change, set into long term paleo-climate events, solar changes and Ice Ages from Milankovitch's mathematical data and questioned the new idea of hyperobjects? Is climate change a hyperobject? Is Gravity a

hyperobject just as the internet a hyperobject? The hyperobject story is a way to understand all of the thousands of years of change as a symbiotic relationship. Indeed climate changes, humans change, there are cycles and there are patterns, and what we hope to make of it, is to understand Resilience, how to survive.

In the last 22 years of my work on Rapa Nui, the sediment cores of Rano Kao have uncovered global climate events with long term cycles that are influenced by cosmic cycles and contain within them human stories on this tiny island in the South Pacific. Focusing on the repeating cold and hot events that peak every 637 and 719 years respectively, it is the giant palms who lived through and retained the memory of these events. However, It is difficult for the human story to understand the past without the memory passed forward. In the next chapter, we will look at the ability of memory, inherent and direct knowledge kept within ancient forest that could in fact be a hyperobject, or at least acting within the system of a hyperobject, water.

Palm forest as Hyperobject

Along with the isotope analysis of the Rano Kao core samples, fossil pollen and macrofossils were also identified. From the deepest of the cores there have been fossil pollen of not just the giant palm trees but also 4 other unidentified palms and 17 species of trees. Although changing in quantity over the last 15,000 years the palms have never disappeared until the cold event began in 1390AD and lasted for 115 years ending in 1505AD. Their disappearance does not have a story in the human record. There is no remembrance shared about the giant palms, or cold weather, or the missing of the birds, as the memory was kept in the living souls and their rituals and beliefs. When you devastate a culture then you lose the memory with the tongues of the truth speakers, so it is left to the science to piece the story together again and sometimes go beyond what we think we know and challenge a new idea.

Left behind on the rongo rongo tablets are a few pictographs of giant palms. On a rock is a scratched version of a palm, and in the Rapa Nui language there is the word *miro* for *toromiro* telling of the sacred tree found at each ahu platform. But all of these sacred trees no matter their species were all named *toromiro* if they were part of the sacred ahu. These giant palms were grand in stature growing up to 6ft (2-3m) in diameter and 90ft (30m) tall, slow growing and flowering for the first time at 100 years, they could live to see 300 years easily. Connected together there were once a single forest of 16 million giant palms covering the roughly 63square miles of the island. (Bork, 2003)

The living cousin of the Rapa Nui giant palm (*Paschalococos disperta*) are the *Jubaea Chilensis* who are now endangered and disappearing in Chile. Like the Age of the Giants, the mammoths, mastodons, saber-tooths, giant sloths and Joshua trees, these giants have slowly become endangered to extinction by hands of a changing climate and humans. Therefor it has been speculated about Rapa Nui that deforestation was due to the cutting down of trees for human use. How else can it be explained for those that are interested in the giant moai? Our human understanding attempts to explain through our experience and to those that first wrote the story of using the trees as rollers to move the moai around the volcanic island, it was an off the cuff story which has been difficult to actualize. If one says tree, the image that comes forth from those on the continental land masses are dicots, hard, sturdy and capable. But from the

eyes of the South Pacific, the landscapes are very different, and the giant palms would make very crappy rollers. They are in fact a unique monocot.

Examples of monocot plants are garlic, banana, onion, palm trees, and lilies....So how then did this monocot evolve into the largest and oldest lived tree on planet earth? Many will argue that Bristlecones or Cypress trees are the oldest tree and in fact this is true also, but the bristlecones are dicotyledons, the two-leafed embryo that can continue to grow a new limb or leaf when most of the rest of the tree is dead. Monocots however are single leaf embryos and grow with a singular vascular system that stretches from deep tap roots to a phenomenally large stem, with very large fronds (leaves), an extra large seed or a large bunch of coquitoes and its heart at the top of the tree. The giant palms live a long life with their own unique stem cells that remain active throughout the hundreds of years of the life of the palm. The giants carried their own DNA, moved thousands of gallons of sugary water, breathing and respirating the life blood of the island, the whole forest holding roughly 2 billions gallons of water. Their only nemesis was freezing and dormancy could not be tolerated as it would cause irreversible cavitation, including the idea of puncturing the tree would effectively cause death by bleeding out. Therefor the giant palms sustained and remained on the sub-tropical island for a very long evolution until an irreversible event caused a slow death and loss of a great forest. We will learn however that not all palms are the same and the palm forest of Rapa Nui do in fact have a bigger story to tell.

The relationship between the islanders and the events

P. Barry Tomlinson, in his life work with palms, first brought light to my understanding of how unique the giant palms really were:

> "*From an evolutionary perspective, all groups of organisms are genetically unique as independent lineages. However, palms are distinctive in that they can make tall and long lived trees entirely by primary developmental processes. The success of palms in their tree making abilities arises, in part, because they escape some of the ecological limitations of trees with a peripheral secondary vascular cambium. This includes fire and pathogen resistance, and minimal susceptibility to wind damage. One constraint of the palm habit is its seeming inability to undergo dormant periods, so that palms are inevitably almost restricted to tropical and sub-tropical regions. On the other hand, palms have fully explored the developmental possibilities inherent in monocotyledonous construction, most significantly in their vasculature, as was early appreciated by von Mohl, 1849). The palm behaves, in a sense, more like an organism with unitary (animal-like) construction rather than with a plant-like modular construction. Palms also function in time and space according to elementary principles of body size and allometry, ….the vascular system of the giant palm is three-dimensional and continuously functional……..The palm is a self-regulated organism resembling the closed (unitary) growth of most animals rather than the modular system of most plants.*"

This new awareness begged to look at the potential relationships between the islanders and the trees.

Arriving on an island for the first time, islanders from afar found a dense palm forest and 40 species of trees and plants (gossen) found under their canopy. Along with the ecosystems in the crater lakes and hundreds of springs, migrating birds as thick as clouds arriving seasonally, turtles and tuna to fish, there was a bountiful system of life happening here. Working together nature had been functioning as a viable life force for thousands of years. Change however was not something new. Long periods of drought, cold and hot events are noted in the sediment cores that date back to the Last Glacial Maximum. The question then leads to ask, how did the islanders survive and thrive through the changes? And how did nature shape the culture and their beliefs? Did they in fact have relationships with the trees and other life forces on their island?

If we return for a moment to the idea of hyperobjects, invisible, viscous matter that affects a large collective and often functions until being noticed or changed. One does not notice gravity (a hyperobject) until one acts with or against it (i.e., falling from a cliff, building a statue, or felling a tree). Water as a hyperobject would have been the same, and on Rapa Nui the islanders had names for storms, rain, water, lakes, springs and the spirit for all of these. Observations of change however kept things in check as the 300 water (vai) sites would change with the tides, brine when the tides were high and would run dry in drought. Instructions were passed down through families in how to find the clear water where the moss grew. Rainfall was clearly a sacred gift from nature. Where it collected was a sacred place for man. Seasonal changes brought water through varying phases, sometimes there was hail and snow, sometimes daily storms, some months with no rain at all. The periodicity of climate events revolves around 70-100 year intervals, just as the time it takes for the giant palms to flower. These periods are short enough that a person may be born and die in this time period and perhaps explain the familial moai being constructed as remembrance and support of their ancestors. The locations of ahu and moai with their sacred trees, were all distinctly located and aligned with water and the cosmos.

Using the term hyperobject we can see a wide influence, a common experience around the planet that was shared without direct contact. For example the sighting of the supernova explosion of 1006, followed by 1054 and 1066AD, all occurred within a human lifespan. More followed in 1181, 1572, 1602 and 1885AD (figure 5). These are the most visible, noted in the history of many cultures around the planet. The sighting of these comets and supernovas, perhaps the invisible energy and climate changes that correlated with them, drastically and distinctly changed human behavior. In some places there was war, in others there were large ceremonial centers being constructed. Therefor one can infer that a cosmic event can be included in the use of the term hyperobject. During the time between 1000AD and 1100AD on Rapa Nui, the islanders were inspired to construct increasingly larger statues around the island of male elders that faced inward with eyes upward toward the heavenly skies.

Prior to this very active time of the supernovas, around 880-900AD (1144BP), there was a great global drought lasting until 912AD. Within a hundred years that followed, the cosmos was very active with 241 solar eclipses and 246 lunar eclipses happening between 1000-1100AD. In that time period Haileys comet returned in 1054 when SN1054 exploded and remained visible for two years and then settled into what we now call the Crab Nebula. Records are plentiful around the planet marked in cultural artifacts. Woodhenges were built, volcanoes exploded, and

temples were constructed to reach into the heavens. The ahus on Rapa Nui were already in place as was the response and intensity of creating the moai. One could say that the cosmic events of this time were acting collectively as a hyperobject influencing the behaviors of human.

From the mat cores of Rano Kao the bottom of the 4 meter core dates to 1130AD, and at the point of 1173AD there was a lot of charcoal found in this sample. Over the next hundred years between 1130 and 1230AD the environment on the island was hot and dry with a long drought reaching into 1230 (figure 4). Working with the German Archaeological Institute in 2014 at Ava Ranga Uka, Dr. Annette Kuhlem discovered planting pits in the ceremonial basin. Amongst the canals built to move water were circular planting pits roughly 80cm in diameter that clearly show the islanders were in relationship between water and the giant palms perhaps to save the last palms, or as fertility ritual location to ensure a healthy future in their island. The time period here has multiple layers of dams with a distinct link with the drought of 1230AD and following when the island became very cold and wet over the next 20 years. Also located here at a high point above the basin is a lone moai overlooking the site at Ava Ranga Uka, facing north, miles into the interior of the island.

Slowly over the next 60 years things returned back to what appears normal evaporation and temperatures much like the climate of today. The next 40 years then cycled in the opposite direction toward hot-dry with a prolonged drought. During this time in other ceremonial centers around the planet, abandonment was the rule. The focus was on the cosmos for so long as it was very active and the earth was responding with volcanic eruptions and climate change as well as the human endeavors exploded, then things began to change again. Humans were already very aware of the returning broom star we call Haileys comet (76 years) which also follows the 72 years between the 1 degree change in rotation of the sun. By the time 1350AD arrived a very cold and wet event once again lasted for years on the island, and then for a few more years slowly warmed until 1390AD a record hot dry event returned. However it didn't last very long and what followed is the beginning of a repeating cold event on its rotation of its 637 year cycle.

The next 115 years border the beginning and ending of this extreme cold event that repeats every 637 years. Aligned with the mathematical observations of Milankovitch, this event was a return of a Little the Ice Age. Rapa Nui being a small island in a vast ocean picked up discrete global signals in which we found marked in the sediment cores at Rano Kao. Until this point the resilience of the island depended upon the giant forest and its ability to buffer hot and cold events and drought and erosion due to the enormous amount of water contained within these trees. Long ago when I began my work with tree ecology I had a conversation with Irving Friedman about the loss of forests and rainfall as he had made the realization through his direct fly over Marajo Island. As he looked down upon the island he could see half was completely deforested and the other still had an intact jungle. He tested for rainfall and water and was not surprised to find with the same amount of rainfall across both sides of the island, it was the side with trees that retained more than half the water consistently while the other side just dried up. The forest there became the hyperobject just as the giant palm forest on Rapa Nui who retained, respirated and maintained the life of the island.

The 637 year cold event last peaked in 1456AD. It was ferocious, lasting longer than the giant palms could survive. Their nemesis being freezing conditions and dormancy. The temperatures that would have effected the island were the most extreme in the last 9000 years. The cold temperatures would have cavitated the palms causing them to drop their water down into the roots for survival. And as they stood there for 115 years during this long cold, they did not flower or produce new seed and eventually the forest began its slow death. The hyperobject in this case, the palm forest, was the buffer and shield for the islanders. They would have witnessed death of a large scale of many living species on the island.

Figure 6 Illustration of Rapa Nui Giant Palm Tree and its pollen.

This last extreme cold event that peaked in 1456AD in the Southern Hemisphere was a predecessor to what eventually was called the Little Ice Age in the Northern Hemisphere that followed. However as soon as the island warmed in 1505AD distinct culture behaviors had taken root. Lithic mulch was being used to grow food, these protective rocks used to hold water and protect against solar and wind intensity as the islanders attempted to intensify growing food. The palm pollen had mostly disappeared and the moai had stopped being built. The Birdman Cult of Orongo followed as a shift to a nature centered belief of unity. And another cooler and wetter event began with a slow decent over the next 100 years from 1505-1605AD. While the Northern Hemisphere was now freezing, on the island this was a time of torrential rainfall. By 1785AD the local environment became much of what we see today. However these favorable conditions opened up and set sails for slave hunters and a cultural collapse ensued.

In reflection the islanders would have been very aware of the changing and repeating climate and weather events, they would have been prepared and made notes, marked certain rocks, aligned the moai with celestial events and most importantly lived and took care of the forests. The loss of the trees however changed the conditions on the island, and I am certain that things were difficult for a long many years. Today without the living palm forest, plants do not survive, they just don't grow. Massive erosion on the island from the loss of trees is very evident including covering some of the moai up to their necks in soil which dried up after the loss of water. Over the last 2000 years rainfall has been consistently the same, but without the palm forests things on the landscape have forever changed.

2027: Return of the AKU

The bottom of the 9 meter core KAO3, radiocarbon dated at 15,000BP, is most certainly not the end of the core, but the limit of the hand corers which is the only way to core the lake. At the top of the mat is modern day plant growth. The continuous sediment core offers great detail in how climate has changed marked with very serious and long droughts, extreme cold and hot events and a long trendline that has been moving toward wet and cold (figure 3). When we magnify the last 2000 years, we can safely say human has arrived during these events. Although there is strange unidentified evidence of what appeared in the pollen counts as human presence elsewhere. Archaeologists are still in disagreement on actual human arrival dates, from which direction arrival came first, and with whom contact was made but new evidence is now available to expand these ideas.

This paper considers the idea of the importance of the hyperobjects at play in the story of Rapa Nui. There are the solar events that cycle and repeat with varying intensities affecting a very active feedback system with the atmosphere protecting our planet. There are also the hyperobjects as cosmic events like the eclipses, comets and supernovas that marked many cultures around the planet as well as on the island. Then there is the hyperobject, the collective forest of giant palm trees which acted as the mechanism buffering the changing climate events. The last cold event that repeats every 637 years and the hot events in opposition every 719 years came very close together during the last great cold event. In 1353AD the extreme drought event stalled for 40 years then plummeted slowly to leave the island very cold and dry, peaking in 1456AD, a hundred years later (figure 4).

When we look deeper into the identity of a hyperobject, there seems to be inherent intelligence in the way that it acts collectively, such as a cloud collects moisture and the storm pulls the energy together and drops the rain. The environmental events may have acted upon the palm forest, but remember the palms had an animal like behavior, each with their own DNA, collectively coming together as a single identity as the forest. Just as trees act as sentient beings, they communicate with each other, have memory and exchange information between their roots, mycelium and fungal networks. Trees can learn and remember stimuli. They also adjust their water management and prepare for seasonal changes, temperature fluxes and drought. With deeper insight the giant palms detected light at the top of the canopy along with their beating hearts moving water through their vascular system. They also had the potential to remember touch, smell and the saliva of those insects and animals that interact with them. Trees can also recognize and nurture their offspring.

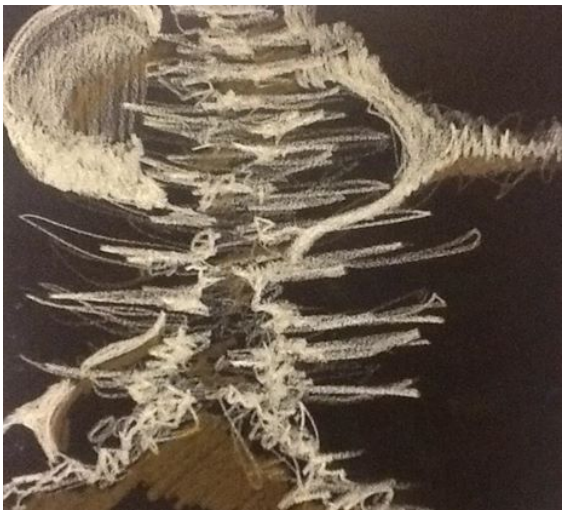
There are many stories of a remaining stump of a conifer that was cut, remaining alive without limbs, leaves or any way to photosynthesize. The mother tree and those in the collective send nutrients to the stump to keep it alive. The forest has alert signals with innate intelligence that live within families. In *The Hidden Life of Trees*, Peter Wohlleben, a German Forester, argues that to save the world's forests we must first recognize that trees are "wonderful beings" with innate adaptability, intelligence, and the capacity to communicate with — and heal — other trees. So not only did the giant palm trees take care of the entirety of the forest on Rapa Nui, they also took care of the other species of trees and plants under their canopy. The very essence of the giant palms length of evolutionary existence on the island and beyond, shows with evidence that they are a hyperobject that adapted to changing climates for thousands of years. Ones that could sense solar events, changing temperatures, migrating birds and humans. Just as dicot trees share sugar in their root tips to keep dying trees alive, the giant palms are full of starch which also is shared in their deep tap roots and have horizontal ability to grow more roots from the direction of the brains in their root tips.

When a tree dies within a naturally stable forest, it falls and opens the canopy. Collectively together the canopy cools the earth beneath it, when opened it heats up changing the balance and limits of tolerance. With climate change and loss of trees, the soil heats up and other important microbes die leaving the soil infertile. During a drought the palm would conserve water until rainfall returned and remembered for the 300 years of its life and passed down this knowledge to the new trees. Thousands of years of stories that were retained within this collective palm forest of giants. As a hyperobject, the trees were the teachers preparing the observers about the returning events, perhaps in relationship with the islanders. The relationships between trees are very real, where one will grow next to another purposefully, and deliberately turn away from another they dislike. Perhaps there were relationships between trees and birds to justify the huge return of migrating birds to Rapa Nui every year. They, just like the forest, called to their friends. The stories are endless, but we will never know for sure as they have disappeared, and resilience of the island will depend on the energy that was once and still is a part of the island.

When the next cold event, expected to begin around 2027AD the questions will be: How long will it will last, how intense, how extreme will the temperatures be and will drought come with it or a deluge of rainfall? We cannot predict how, but it will happen. Knowing that all of the

water that was held in the giant palms shifted and was sent into their roots, down into the aquifer we can measure the changes in moisture there. And what we are finding now is that the aquifer, under human pressure and higher evaporation, is lowering deeper beneath the soils every year. Once the crater lake Rano Raraku was a shallow marsh, today it lies empty and dry. Springs that returned every storm season no longer rise to the surface. Human caused climate change is warming the surface of the planet both with sea surface temperatures rising and deforestation and without the buffering of the forests the soil remains dry across the grasslands on Rapa Nui. Where will the resilience come from?

Resilience of the future



Recognizing the idea of hyperobjects as innate intelligence that contain energy is a new concept emerging but it is not a new idea. The idea is conceptual, by its very nature can influence even if people are not directly aware of it. The hyperobject is so large, containing a vast space that is often beyond the comprehension of human understanding. For example, black holes in space cannot be touched nor seen by the human eye, but the concept of them is intriguing and scientists are finding ways through technology to share the news. Global Warming is another hyperobject that humans have a difficult time accepting and understanding due to its vast spatial and timescale. Perhaps accepting small actions have collective results and that we can release chemistry that enters the atmosphere, traps more greenhouse gases and warms the planet will cause change? The story of ozone and the quick awareness in its potential to change the ozone layer in the atmosphere causing serious harm on earth, was an accepted fact and change came quick to reverse the damage. Hyperobjects demand humans to pay attention. To understand a forest is breathing and adding oxygen to the atmosphere and humans necessity to breathe is a duty by us to honor. To realize on Rapa Nui that the giant palm forests acted as a protector, perhaps required an example of an AKU. Finally coming back to the title of this paper Waking the Aku, we have to tell a final story.

To the Rapa Nui people, an Aku is an invisible entity, can change its form, and can be benevolent or malevolent as needed. Over time on the island, ancestral caves and sacred places were thought to be protected by akus. Some of the myth claims an aku-aku came to the island on a canoe with the first King, others believe the aku was part of the island long before humans arrived. Just as the red star Pau was often seen as the evil eye, as it was a harbinger that correlated with drought, the Aku was the interaction between human and nature, they were honored and respected. Some stories say that Akus still remain on certain geographic parts of the island and remain there today thousands of years later.

As in Maori myth similar to the Rapa Nui, spirits and sometimes gods personified normal everyday things like Tangaroa becoming a Tuna fish, containing the big mana energy within a

small simple thing. Humbleness. The god-like entity such as the fish could become abundant if people did the right thing and then they would be rewarded with an abundance of food. This tuna in the myth descended from heaven (god becoming earth) from the constellation *Tunaroa*. The connection to the cosmos was the way the Polynesian travel on their star map across the Pacific Ocean, and holding respect and reverence for their protectors was very important. Shapeshifting is one of the tuna spirits gift, which can adapt to many different waters and places. Therefor the way for a long life came from adaptation with the helper spirits which were represented in all living things on the island and beyond. Trees would also be one of the shapeshifters, as we already know that any tree was given the name *miro* when it was placed near a sacred place like an ahu.

Tapu otherwise spelled taboo, were added to the nature of survival on Rapa Nui. In order to survive on an island very far from another land mass, people quickly realized the boundaries of existence between them human and their natural resources. Setting Tapu would ensure species would survive, it would instill a mindful existence and respect with everything. This is the way that humans survived along with the forests in a changing environment with its many cycles and events that returned and pressured their survival. There is no doubt that the giant palms were part of the story as well. Some islanders were the protectors of the trees, as others were of the fish, and the water. An Aku would then appear if something was not respected, abused or if a tapu was dishonored.

Pulling these ideas together, a hyperobject could be the same as an aku if we related it entirely to Rapa Nui. But just as a hyperobject is global, so are akus since they travel in time and space. If stories survived there may have been a story about an aku that returned with drought that watched over the water and the trees to make sure they survived and returned. The akus could have lived within and among the trees since the giant palms held intelligence and sentience. The Rapa Nui people would have been very keen in observation and aware of these things.

What will happen when the last cold event returns? Mathematically calculated on an average of every 637 years with the last event beginning in 1390, the next expected event would return around 2027AD.

We could in fact already be in the beginning of the return of this climate event. For the islanders summoning the good Akus, could they protect them from the outside cosmos that they periodically watched in the supernovas, comets, storms, snow and hail and disease? If the moai of the living dead elders failed to be anything more than stone, the islanders would turn to the living and life on the island. They would have looked to the wisest elders, the giant palm trees for protection.
And wise they were.

The intelligence of the forest could predict through memory and observation before the humans would notice.

> "*Well then, in this immensity of length and breadth and height there flits an infinite quantity of atoms innumerable, which though separated by void yet cohere together, and taking hold each of another form unions wherefrom are created those shapes and forms of things which you think cannot be created without the aid of bellows and anvils, and so have saddled us with an eternal master, whom day and night we are to fear.* (Cicero, p54)
> ….. *But Epicurus has set us free from superstitious terrors and delivered us out of captivity, so that we have no fear of beings who, we know, create no trouble for themselves and seek to cause none to others, while we worship with pious reverence the transcendent majesty of nature. (Cicero, p.56)*

I believe the giant palm forest was a protective spirit, a hyperobject, an Aku. So as 2027 approaches, shall the Aku awaken and teach us about resilience? To learn about nature with respect, humbleness and intelligence? Perhaps the spirit of the forest that once lived and breathed on the landscape of Rapa Nui, is still there. Maybe the forest spirit as a hyperobject may still remain as the belief that Akus remain on the island. If so, may the Aku awaken.

Further Reading (References)

1. Berger, Andre. 2021. *Milankovitch, the father of paleoclimate modeling. Clim. Past, 17, 1727–1733,2021. https://doi.org/10.5194/cp-17-1727-2021. EGU, Copernicus Publications.*

2. Berger, A. 1988. *Milankovitch Theory and Climate.* Reviews of Geophysics, Vol. 26, No. 4, Pages 623-657, November 1988.

3. Blink Productions. BBC Documentary. 2014 Secrets: Easter Island, Season 2: Episode 1

4. Bork, H.R., and Meith, A. 2003. *The Key Role of Jubaea Palm Trees in the History of Rapa Nui: A Provocative Interpretation.* Rapa Nui Journal, v.17 (2) October 2003.

5. Butler, K. and Flenley, J. 2001. *Further Pollen Evidence From Easter island. Pacific 2000 Proceedings of the Fifth International Conference on Easter Island and the Pacific.* (eds. Stevenson, C., Lee, G. and Morin, F.J.)

6. Christensen, C. and Skottsberg, C. 1920. *Natural History of Juan Fernandez and Easter Island* v.2

7. *Cicero, On the Nature of the Gods* by Marcus Tullius Cicero, translated by H. Rackham, published in 1933 by Heinemann. Loeb Classical Library Public Domain

8. Dransfield, J., J.R. Flenley, S.M. King, D.D. Harkness & S. Rapu. 1984. *A recently extinct palm from Easter Island.* Nature 312:750-752.

9. Faegri, K. & Iverson, J. 1989. *Textbook of Pollen Analysis.* IV Edition. New Jersey: The Blackburn Press.

10. Flenley, J.R. & S.M. King, 1984. *The Late Quaternary pollen records from Easter Island.* Nature 307: 47-50.

11. Flenley, J.R. & A.S.M. King, J. Jackson, C. Chew, J.T. Teller & M.E. Prentice, 1991. *The late quaternary vegetational and climatic history of Easter Island.* J. Quat. Sci. 6:85-115

12. Gossen, C. 2007. *The Mystery Lies in the Scirpus.* Rapa Nui Journal. v.21, Number 2, October 2007: 105-110

13. Gossen, Candace Lynn, 2011. *Deforestation, Drought and Humans: New Discoveries of the Late Quaternary Paleoenvironment of Rapa Nui (Easter Island).* Dissertations and Theses. Paper 782. https://doi.org/10.15760/etd.782

14. Gossen, C. 2023. *The paleoecology of Rano Kao and the Environmental dynamics on Rapa Nui -the last 15,000 years*. www.eartharxiv.org https://doi.org/10.31223/X5KQ2P

15. Gossen, C. 2023. *Rano Kao and Ava Ranga Uka: Rapa Nui Report 2014*. www.eartharxiv.org https://doi.org/10.31223/X5W98M

16. Gossen, C. 2024. *Ancient Trees and Plants of Rapa Nui: The Last 15,000 Years.* Barnes & Noble ISBN-13, 9798331474379. 132 pages. Also available on Apple Books.

17. Gurley, R. & Liller, W. 1997. *Palm Trees, Mana, and the Moving of the Moai*. Rapa Nui Journal, v.11 (2) June 82-84.

18. Hageneder, Fred. 2005. *The Meaning of Trees: Botany, History, Healing, Lore.* Chronicle Books.

19. Hays, J.D., Imbrie, John, Shackleton, N.J. 1976. *Variations in the Earth's Orbit: Pacemaker of the Ice Ages: For 500,000 years, major climatic changes have followed variations in obliquity and precession.*Science 10 Dec 1976 Vol 194, Issue 4270 pp. 1121-1132 DOI: 10.1126/science.194.4270.1121

20. Heiser, C.B. Jr., 1974. *Totora, taxonomy and Thor*. Plant Sci. Bull.: 22-26.

21. Heiser, C.B. Jr. 1979. *The totora (Scirpus californicus) in Ecuador and Peru*. Econ. Bot. 32:222-236.

22. Kuhlem, A., Mieth, A. and Bork, H. 2019. *The concept of sacred trees in French Polynesia and on Rapa Nui. In book: Easter Island and the Pacific.* Cultural and environmental dynamics (pp.169-177) Publisher: Rapanui Press.

23. Liller, William. 1993. *The Ancient Solar Observatories of Rapanui*. Cloud Mountain Pub; First Edition (August 1, 1993) ISBN-13 : 978-1880636015

24. Milankovitch, Milutin. 1941. *Canon of Insolation and the Ice-Age Problem* by Milutin Milanković, published in 1998 by Agency For Textbooks. ISBN of 8617066199.

25. Morton, Timothy. 2013. *Hyperobjects: Philosophy and Ecology after the End of the World*. U of Minnesota P.

26. Prebble, M. and J.L. Dowe, 2008. *The Late Quaternary decline of extinction of palms on oceanic Pacific islands.* Quaternary Science Reviews,.27, 2546-2567.

27. Skottsberg, C. 1956. *Derivation of the Flora and Fauna of San Juan Fernandez and Easter Island.* Vol 1:438pp. Almquist & Wiksells, Uppsala.

28. Tomlinson, P. Barry, 2006. *The uniqueness of palms.* Botantical Journal of the Linnean Society, 151, 5-14.

29. Vogt, B. and J. Moser. 2010. *Ancient Rapanui Water Management: German Archaeological Investigations in Ava Ranga Uka A Toroke* Hau, 2008-2010. Rapa Nui Journal, V24, No. 2, October.

30. Wohlleben, P. (2016). *The Hidden Life of Trees*. [United States], Greystone Books.

31. Wolfe, Brent and K. Beuning. 2001 *Carbon and Oxygen Isotope Analysis of lake Sediment Cellulose: Methods and Applications.* W.M.Last & J.P. Smol (eds) 2001. Tracking Environmental Change Using Lake Sediments. Volume 2: Physical and Geochemical Methods, p. 373-400. Kluwer Academic Publishers, Dordrecht, The Netherland