

The Spatial Awareness Conundrum in Ancient Polynesia. (With Parallels from Ancient Greece)

Star Pillar Navigation Concepts. Indigenous Experience versus Cartesian Science.

Stan Lusby, now retired, was born in England and has lived in New Zealand since 1971. His early career as a land and hydrographic surveyor and navigator was in the search for oil in the North Sea, Australia and Middle East in the 1960s and as a planner and surveyor in land development engineering in New Zealand in the 1970s. A former Chartered Surveyor and New Zealand Registered Surveyor he obtained lecturing experience at Auckland and Carrington Technical Institutes in the 1980s and The University of Otago honoured him with a degree ad eundem status which led to a Masters Degree in Regional and Resource Planning whilst assisting the university to establish the first papers in Hydrographic Surveying in 1994.

To set the historic spatial scene:

Point to any corner of the room and swing your arm upward along the wall intersection and notice where the projection of that line passes in respect of your zenith. This perception of space is anthropocentric (specific to you). It is totally contrary to what we now understand by the rectangular Cartesian geometry of the room.

It is necessary to understand the intellectual concepts and order that our ancestors established. For example: The Sun arose in the constellation of Cancer in the northern summer solstice of 1350 BC and it arose in Capricorn in mid winter, (our southern mid summer). Ever since we have used their terminology and today we still refer to the Tropic of Cancer and the Tropic of Capricorn. The Sun has not turned in those constellations and the latitudes they defined for a very long time. 3354 years ago our ancestors knew more about the stars and planets from an Earth-bound experiential reality than you and I.

Ancient Polynesian Navigation and Discovery in the Pacific and the legacy handed down to us by Dr. David Lewis and Professor Ben Finney.

Forty three years of research into ancient navigation and discovery in the Pacific have led to some recent conclusions that go way beyond navigation. The two great questions in the minds of Europeans that dominated research, following European contact with Polynesians, centred on issues of vessel sustainability and navigational accuracy (post Magellan 1520 AD). In the Nineteen Fifties, the New Zealand historian, Andrew Sharp, rejected the notion of organised discovery on both accounts and for several years the concept of accidental drift and enforced migration became the dominant scenario. Fortunately, there was sufficient indigenous knowledge throughout the islands to challenge Andrew Sharp's assertions and the pioneering

work by Dr David Lewis of New Zealand and Professor Ben Finney of Hawaii opened doors for the active participation of Polynesians to prove the worth of their ancestral vessels (wakas). The navigational side of the argument, however, became locked into a hybrid of Polynesian experiential and European scientific methods with no real progress beyond tweaking those observations that David Lewis had made when he sailed, aided by a grant from the Australian National University, in the late Nineteen Sixties. Lewis, however, believed there was more to indigenous navigation technique than his research had discovered

This paper follows an essentially European line of historical research and hopefully gives closure to that exclusivity. Fortunately there are signs of developing Polynesian interest and an evolving inter disciplinary and inter-racial consensus movement away from the understandable more recent Polynesian tendency to claim back their own, almost to the exclusion of the European historical research input. A clouding over by the Polynesian contribution, more from esoteric sentiment than academic discipline, merely creates a new undesirable mythology.

David Lewis outlined his experiences sailing with what he thought would be the last of the Pacific's indigenous navigators and these he chronicled in his now seminal book, *"We the Navigators"*. Ben Finney went on to prove that Polynesian vessels could withstand storm seas and had sufficient manoeuvrability to carry out long ocean voyages and both men were instrumental in the first voyage in modern times that took up the challenge where the Norwegian, Thor Heyerdahl, had left off in 1947. With Mau Piailug of Satawal Island as navigator, a replica of a wa'a (waka) sailed from Hawaii to Tahiti in 1976 inspiring the first of many re-enactment voyages from island communities.



State of the Argument for dual propulsion.

I have a serious reservation concerning modern re-enactment vessels in that I believe they should have dual means of propulsion and that implies being constructed, irrespective of length, with freeboard allowing teams to paddle when the claw sail goes limp to avoid broaching in a deep ocean storm trough. The painting by William Hodges who sailed with Captain Cook shows long vessels with low seaboard. There is, however, an argument currently being researched that implies that the finest wakas had pivotal design characteristics that obviated the need for large crews skilled in paddling even in the deep troughs of the Southern Westerlies between Aotearoa and the Chilean offshore islands.

The Search for a Position Line Method of Navigation.

Lewis' anecdotes, questions and his expressed frustrations led me to search for a position line method of navigation that would have given greater certainty to exploration and inter-island contact in the vast Pacific Ocean, with its exceptionally small landfalls, than can be realised through dead reckoning. Two publications by me, Stan Lusby, were followed by two more with a team involving Professor Robert Hannah of the Classics Department and Dr Peter Knight of the Survey Department of the University of Otago and they are archived in the records of the international Hydrographic Society Journal. Hannah and Lusby had an interest in the newly evolving archaeoastronomy, and Peter Knight, a Canadian trained hydrographic surveyor with cartographic experience, was at the time the lecturer developing the Otago papers in Hydrographic Surveying.

The first significant break through occurred late one evening in the mid Nineteen Nineties when the writer, Stan Lusby, returned to his home in Moeraki, South Island, New Zealand on the east coast, 80 kilometres north of Dunedin.

“The verandah of my old house faces north over the sea and the air clarity that night was such that the constellation Orion, that I had known as a boy in Stanborough, Hertfordshire, England, stood out with great clarity. I had for many years known that Orion stands on his feet in the Northern Hemisphere and in the south he does what I call his “back summersault flip”. There must have been a similarity of altitude and azimuth between the two images to provide the “Eureka” for I knew then that I would soon find the desired position line method of navigation that ancient Polynesians used.”

Biologically and anthropologically the most important navigational direction for the Earth-bound human is the line of gravity where the observer stands.

Orion had not, as our Cartesian science tells us, rotated any more than it can be said scientifically that the Sun rises. These are realities based on our past and current experiences not science. Some careful drawing with the aid of a star atlas quickly displayed that Orion had apparently rotated the same number of degrees as the difference of latitude between Stanborough and Moeraki. This meant that if a natural

reference line could be found as origin, the ancient Polynesian core method of position line determination could be re-discovered and deployed in our day. That question too was immediately answered, for, with so much starlight, the northern sea horizon was abundantly clear that night at Moeraki. It too obeyed the dictates of gravity and, what was more significant for ancient navigation technique it was personal to the navigator at his or her location wherever that might be. For our ancient navigators, however, North was not the primary direction of interest and the assumption that it was has severely restricted research for several centuries.

On the Sea, You Gotta be Free!

To be free of the restrictions imposed by European, scientific navigation the Polynesian navigator would need to be free of instruments and more importantly free of a pre-calculated ephemeris. Success would depend on the precision with which a navigator could determine verticality.

The Core Principle behind the Star Pillar derived Latitudinal Position Line Theory.

If, on looking east from one's small island, a star like Alnilam, the middle star in Orion's Belt, arose such that some other star that had arisen before was exactly vertically above it, then the position line that such a two star pillar configuration created would be what we now term a line of latitude that passed right around the world back to the island. Whenever, at horizon level, the line joining the two stars was vertical we would be on our desired position line leading back to our home island.

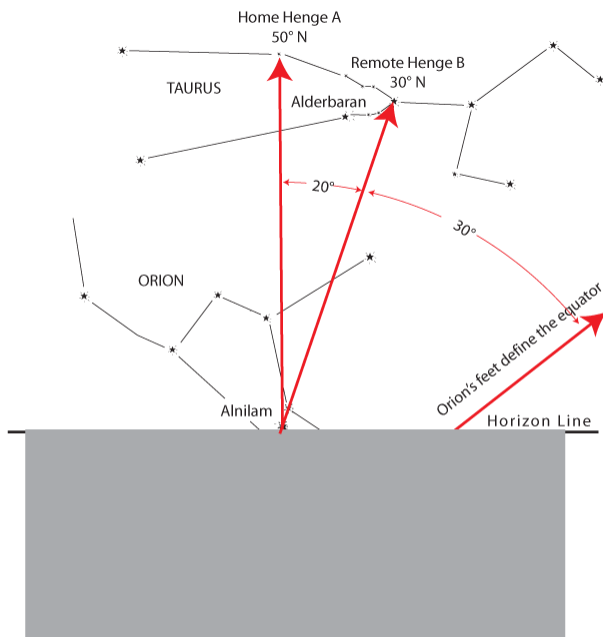


Figure 3: Observations at home Henge A Latitude 50° North 250 BC

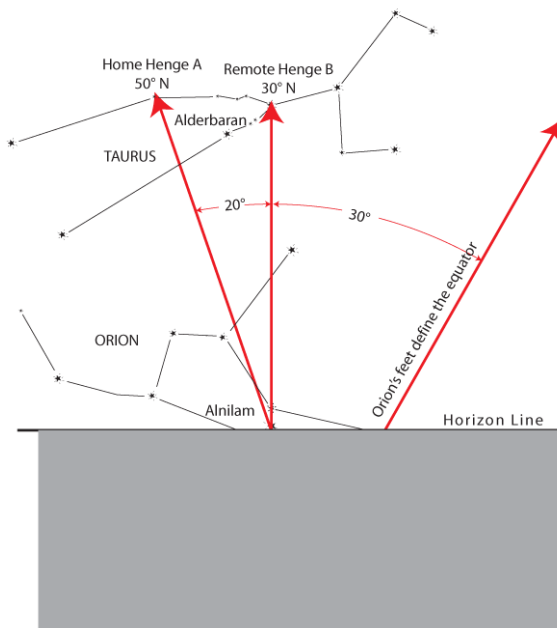


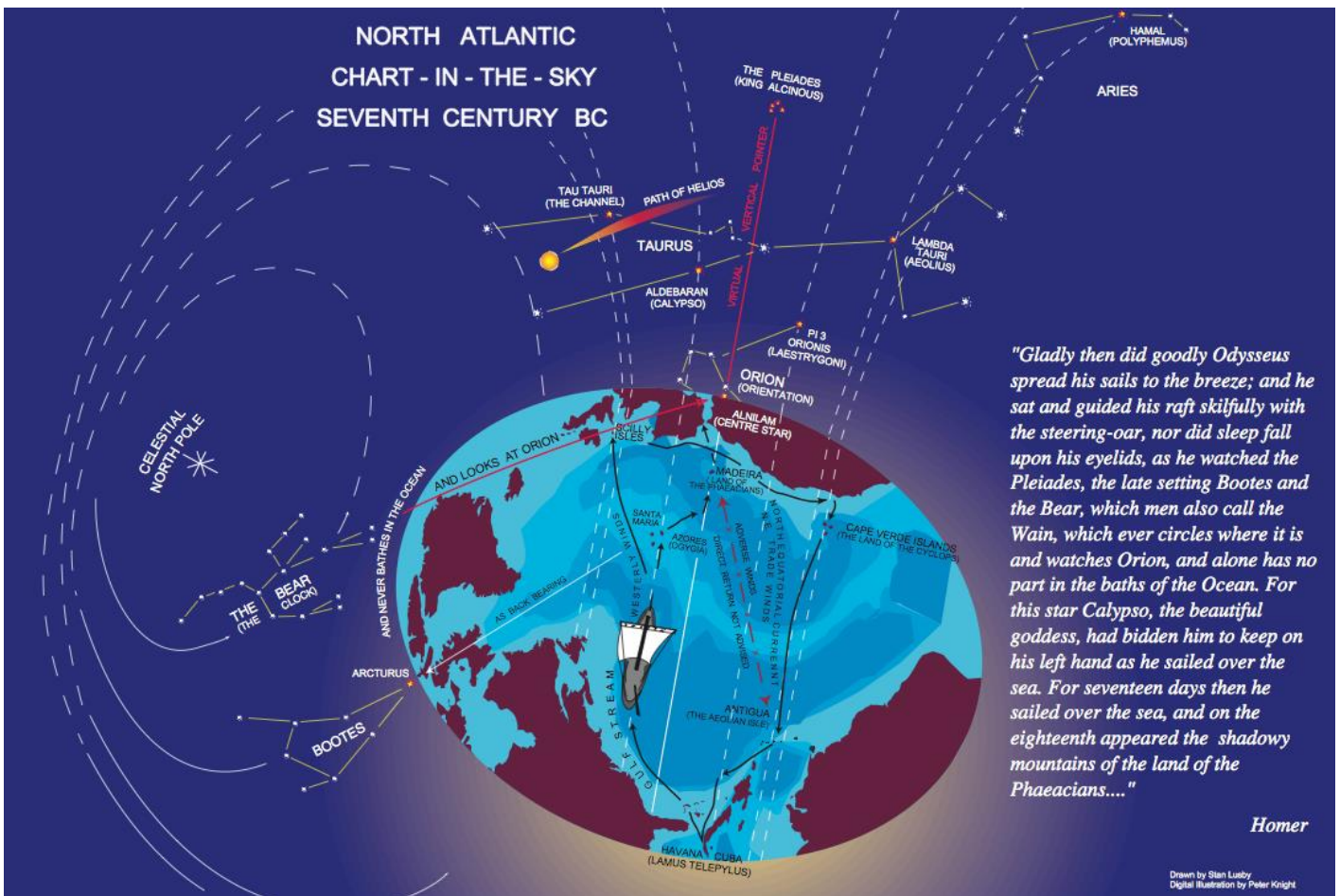
Figure 4: Observations at remote Henge B Latitude 30° North 250 BC

What took another two decades for me to fully realise was that, without concepts of mapping and charting and knowledge of scientific things such as latitude, Polynesians just did not see space in terms that had become familiar to Europeans and Americans. That was another failure of former European research and reasoning and with the increasing dominance of scientific thought amongst Polynesians the old concept of space became almost irretrievably lost but that loss would have been a global catastrophe for further research is suggesting that the extant Polynesian star pillar

navigation methods were available to maritime communities world wide at any time in mankind's history due to their intrinsic simplicity.

The Pillars of Hercules and a Revelation from Homer's "Odyssey".

Europeans have long known of The Pillars of Hercules (Heracles) and they are conveniently thought of today as the two large rocks on either side of the Straits of Gibraltar. The Heracles myths appear to have been tampered with throughout history so if they do contain information for ancient navigation it is now far from obvious. Homer's Odyssey, however, is still subject to his incredible discipline and detail and any interference with the poetic story line lays the academic open to the risk of peer group ridicule and condemnation. It has, however, given ample scope for hydrographic surveyors like me, (using star pillar theory), to suggest that the so-called myth contains a very precise set of navigation instructions for sailing the North Atlantic in the 7th Century BC at a time when Homer is thought to have lived.



Modern Astronomical Software.

The availability of astronomical software such as Chris Marriot's SkyMap has totally changed research in that it allows the stars and planets to be set back in time. This allows the researcher to correlate known astronomical events with historical and archaeological evidence and vice versa with the result that aspects of Victorian era derived chronology have become suspect along with some of the locations that were derived with drawing room sentimentality more mythical than the myths they claimed to resolve.

Homer's Odyssey

There is a famous passage from the "*Odyssey*" in which the goddess, Calypso, on the island of Ogygia, (which Homer called "*The Navel of Oceanus*"), gave astronomical instructions for Odysseus to sail to the land of the Phaeacians, Scheria. It contains all the elements of star pillar navigation. If one refers to an island as a "navel" it implies that both sides of the belly are known.

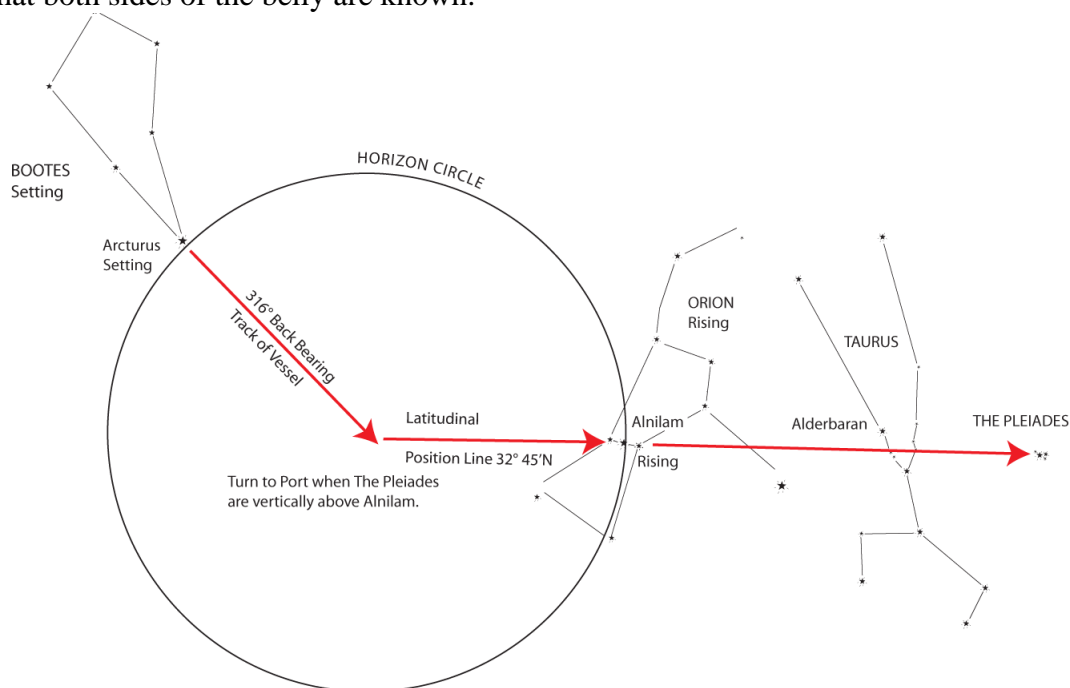


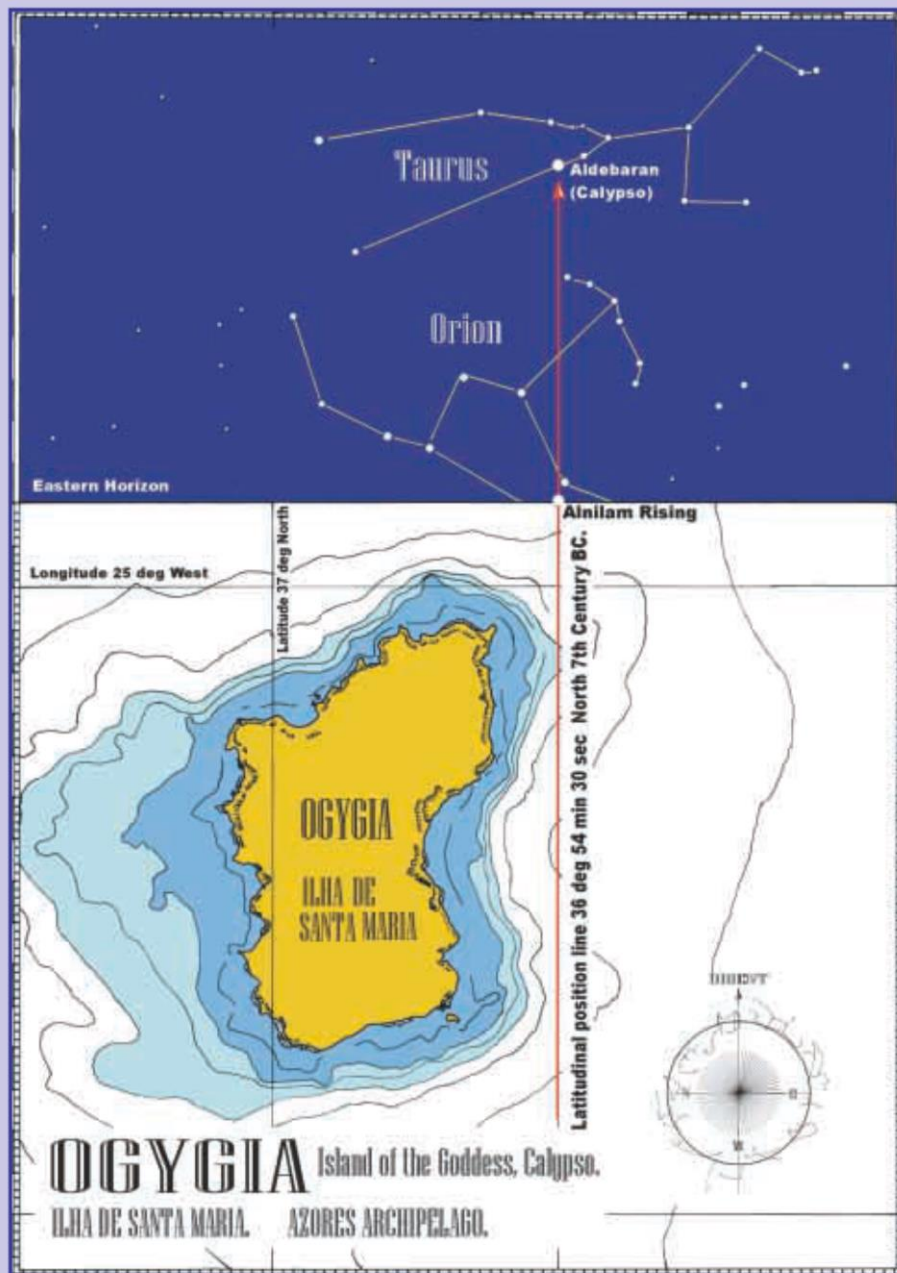
Figure 5: The use of a compass star to intersect a position line. (Circa 550 BC, c.f. Calypso's instructions to Odysseus. The "*Odyssey*" by Homer in 7th century BC). Arcturus as a backbearing compass star guides the navigator for the first part of the voyage. The vessel arrives at a waypoint on the latitudinal position line when The Pleiades are vertically above Alnilam as it rises. The navigator then turns to port and homes in on the destination island using this same rising configuration. The importance of "undershooting" the island cannot be over stressed.

Ogygia has been recently identified as Santa Maria in the Azores and the destination island as Madeira with the landfall occurring in 668 BC. With Alnilam in the centre of Orion's Belt as clocking star and with the Pleiades as the capital of that star pillar, the latitudinal position line to the destination island has been identified as 31 degrees 47 minutes (North). Arcturus in the constellation Bootes as it descends to the north western horizon provided a back bearing on Santa Maria which Odysseus used by

then selecting suitable forward bearing compass stars for the first part of his voyage. The Great Bear did not set at these latitudes for it was circumpolar (it did not bathe in the ocean) and the fact that it looked at Orion gave our navigator an indication of when and where Orion would rise. Calypso told Odysseus to keep the Bear on his left hand and so we know he sailed predominantly eastward. On the night that the Pleiades became exactly vertical to the rising Alnilam in the centre of Orion's belt, Odysseus had arrived at a waypoint where he turned to stars known to be due east and by checking for verticality of his star pillar each night and correcting course if needs be, he arrived at the Land of the Phaeacians.

In the year 669 BC, one year before this voyage, (starting 15th April at latitude 33 degrees North) there is a conjunction situation in which Venus (Athene) is seen to run along the ecliptic beside her father, Jupiter (Zeus,) and he, shortly thereafter, seems to order Mercury (Hermes) to go into retrograde motion and make for the bright star, Aldebaran in Taurus (Calypso). The messenger, Hermes, having delivered Zeus' message ordering Calypso to free Odysseus (19th May), resumes normal motion and returns to the ecliptic and the other planets. Due to sunlight the event had to be viewed and deduced by staking out on the rising and the setting horizons in 669 BC and there would have been eighteen days of guessing at the ancient henge. (Fortunately sunlight can be ignored on the computer.) This event fits very neatly with the text in the Odyssey. There is a dialogue in which Calypso observes that Hermes had not visited her for a very long time and Hermes questions why anyone would wish to cross such a vast expanse of water. A scan of the centuries before 669 BC and up to the present indicates that the retrograde movement towards Aldebaran has been an extreme rarity and Hermes could only be observed skipping low on the sea horizon due to the complexity of him being obscured by sunlight.

These apparent retrograde motions occur due to the fact that the inner planets, Venus and Mercury, as they swoop in between the Sun and the Earth, are being observed from the Earth itself which is also moving. Once again: an experiential reality rather than a scientific one for their paths are elliptical as with all the other planets.



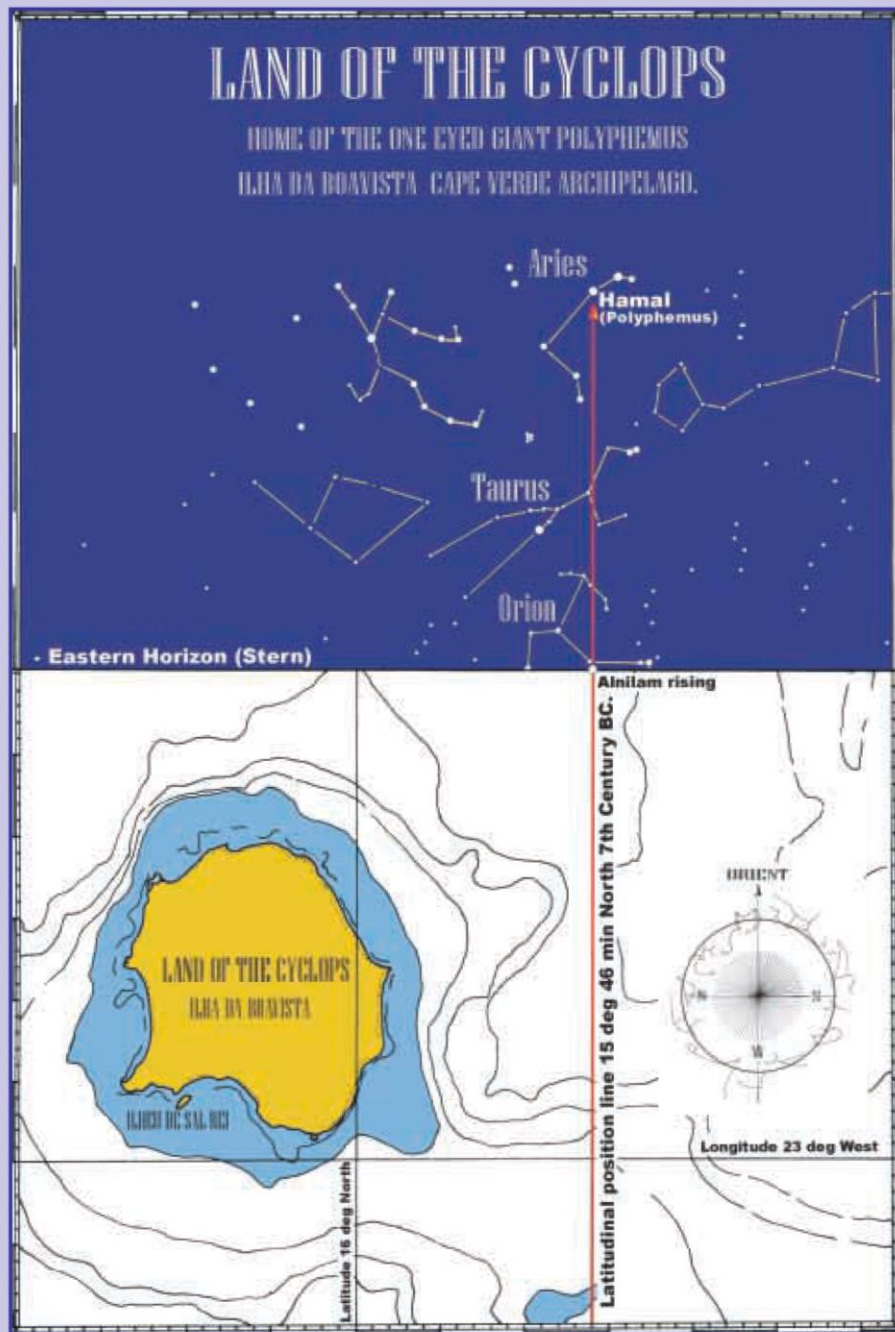
When a star pillar is created with Alnilam in Orion's Belt as clocking star and Aldebaran (Calypso) as capital the derived latitudinal position line runs close to Santa Maria in the Azores Archipelago at this time in history. One can visualise the Daanan/Greek priesthood directing an exploration vessel along this star pillar at some earlier date and, in this way, discovering the Azores.

Completing the picture in the sky within the "Odyssey", Homer recounts a story of Athene (Venus) visiting Naussica the daughter of King Alcinous early on the morning after Odysseus arrives shipwrecked on Scheria. Homer makes it very clear that Naussica is a virgin and in this way alerts us to the constellation Virgo. Spica is the

brightest star in this constellation and could well have been known as Naussica in antiquity. On the 22nd of September 668 BC, SkyMap shows Spica (Naussica) rising in paranatellonta (rising together) with Venus (Athene). The Sun is in such a position that on this morning Spica is seen for the first time and Venus for the last time thus giving us a type of very specific ancient dating device. It all fits with Homer's dialogue. He also tells us that the voyage of Odysseus took eighteen days and allowing one more for Naussica to discover him and then working back we can deduce that Odysseus left Calypso in Ogygia on the 3rd of September 668 BC. (Not withstanding the vagaries of our various historical calendars!). (In my earlier paper: "*Odysseus, James Cook of the Atlantic. 7th Century BC*" I incorporated wrong data and the dates are wrong.)

This all seems a little too precise but the reader can experiment with astronomical software at any time to verify these situations. The researcher needs to locate a hypothetical viewing platform (henge) similar to the one that Homer must have used, at a latitude south of Spain (say 33 degrees North), with east and west sea horizons looking out from an imaginary elevated plain, then make very careful incremental observations day by day with deductions at horizon level. Regrettably we have no way of determining where that platform was beyond the approximate latitude at which the horizon story unfolds. Stonehenge is far too far north for our purposes.

More recent research has suggested that it may be possible, within the associated historical chronological time span between 1300 BC and 650 BC in which various academic arguments place Homer, Troy and the Odyssey, to define an equivalent voyage from Malta. However, the star pillar formed with Alnilam and the Pleiades only becomes erect deep into the south of the Gulf of Sidra and, unless sea level back then was considerably higher, there are no significant islands in that part of the Mediterranean before arriving at the North African coast. Calypso's navigation instructions just do not fit in any other part of the Mediterranean. An 18 day voyage does not fit either. This research vindicates those throughout history, such as Eratosthenes (who was born in Cyrene to the east of the Gulf of Sidra). He asserted that the "Odyssey" did not occur in the Aegean or the Mediterranean and this research also refutes Polynesian claims that ancient European navigators hugged the coast, for the coast can be a very dangerous place to navigate a vessel without engines in a storm.



These sky happenings in all probability did not coincide exactly with the exploratory voyages and regular Atlantic trade but were used within the Homeric Myth to pass on otherwise secret navigation information to an esoteric guild of priest/ navigators.

The Consequences of Modern Archaeo-astronomy.

The outcome resulting from our archaeo-astronomical research into Homer's Odyssey could seriously compromise a great many academics of classical disciplines and it is likely to be rejected more from the perspective of job security and peer-group pressure than true academic research commitment which is now on a new level of scientific investigation using modern astronomical software.

The recent involvement of hydrographic surveyors in the interpretation of myth and chant has provided information that sometimes conflicts with cartographers, archaeologists, chronologists, anthropologists and historians as well as classics scholars. It has rendered research more inter-disciplinary, calling for an improved consensus overview. To the writer, myths and chants contain information of actual happenings that we would no longer describe that way. In the absence of written, archived material, research is vulnerable to the argument refuting its validity but when a whole series of deductions begin to align the researcher gains confidence. When that alignment occurs in two different hemispheres at very different times in history then one is justified in publishing the outcomes but one must always leave the way open to change if and when some future technology changes the scenario. There is no room for the adversarial approach if one's ultimate goal is truth.

Inevitably, the researcher becomes involved with aspects of astrology as well as astronomy in which chronological determinants are marked by conjunctions of planets with key stars, as indicated above. This is a sensitive area for any mention of astrology and conjunctions, provides the detractor with a readily acceptable line of character assassination. To the hydrographic surveyor this is not an embarrassing issue because, in taking his or her vessel into uncharted waters to inform other mariners of hazards, the surveyor has always needed to know how much water he is likely to have beneath his or her keel and this is very much a feature of the conjunction of the Moon, Sun and Earth and its effect on tides. In the mid Nineteen Nineties there was an astronomically large tide forecast for the North Sea. The consequences for the Netherlands and parts of East Anglia and the London Underground could have been disastrous if that tide had coincided with a powerful storm blowing from the north. The narrow Straits of Dover restrict tidal movement south and so the Dutch joined up all their islands and the British built the Thames Barrier just in case.

Lifting Up the Heavens.

Polynesian mythology, like many others, talks of the heavens being lifted up from the Earth. Such a lifting would have given new horizons for the mind to act upon.

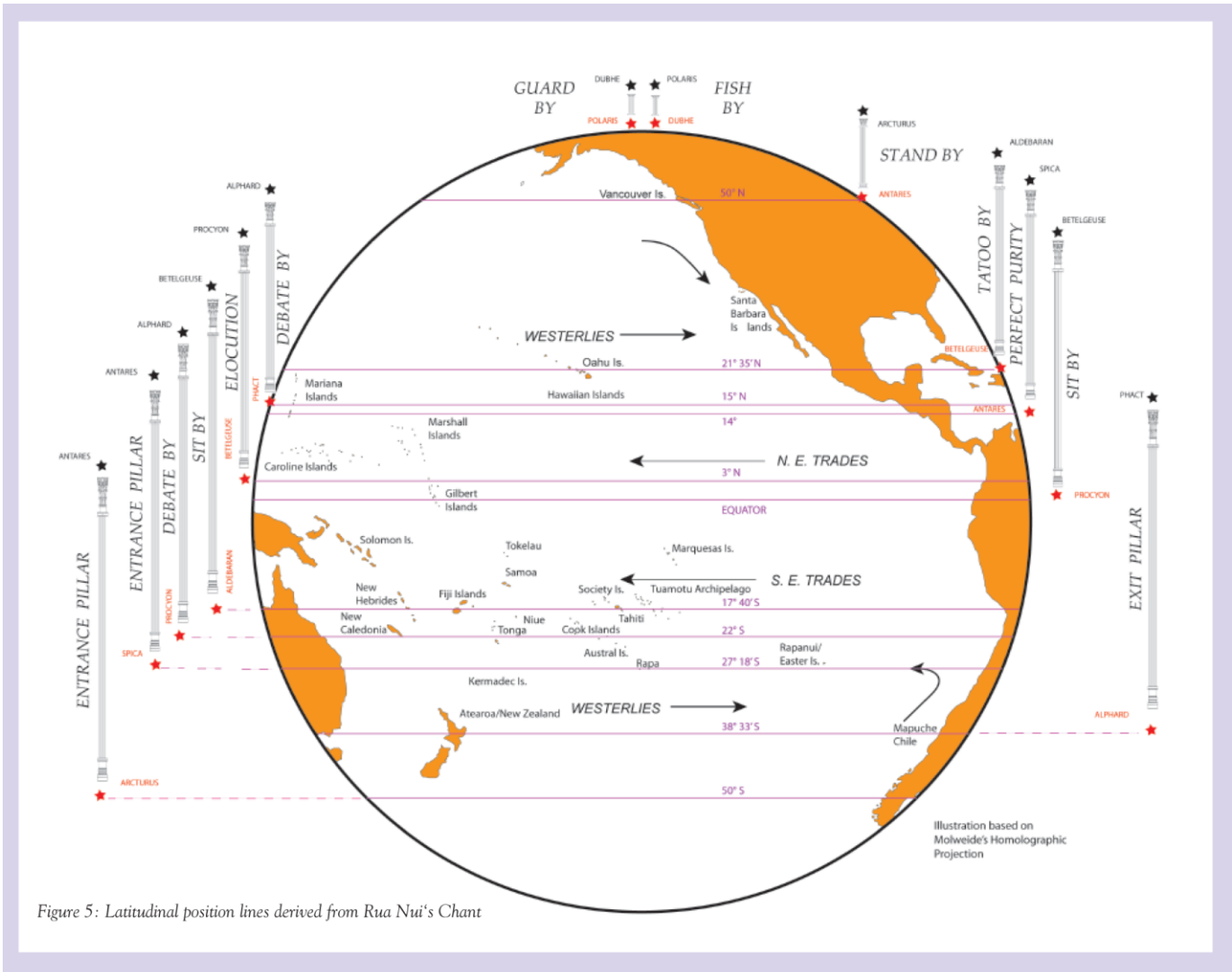


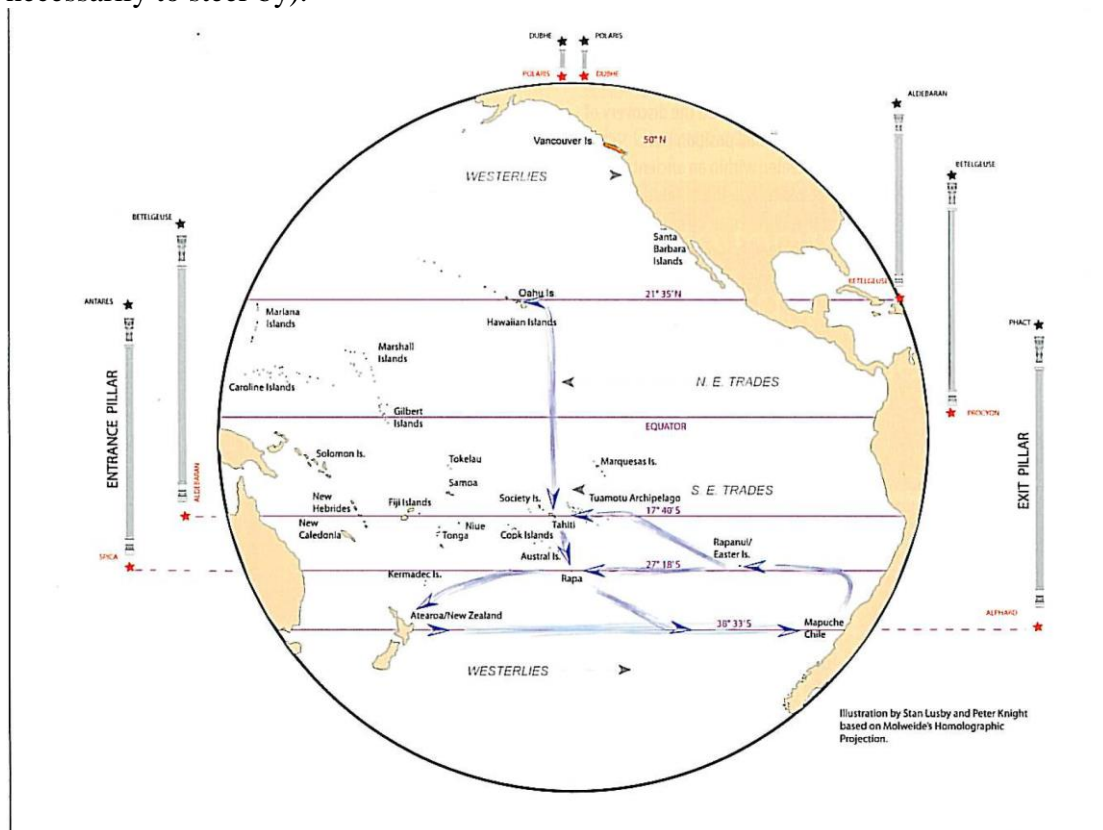
Figure 5: Latitudinal position lines derived from Rua Nui's Chant

The newly re-discovered star pillar technology would have allowed such peoples the freedom to wander and to use the star pillar of their home community to guide them back home even if mountainous topography necessitated a deviation or one became storm drifted at sea. Certain pre-observed physical monuments, natural or man-made, acting as waypoints such as the Rock of Gibraltar, the Tower of Babel, the Kermadec Islands, the Colossus of Rhodes and eventually the humble sign post would gradually have augmented the star pillar information and greatly helped travellers. Modern research indicates that Polynesians and Daanan/Greeks were capable of establishing virtual waypoints in mid ocean, something that the navigation system of dead reckoning is incapable of doing without instruments, an ephemeris, a chart and some means of determining longitude. We often forget that knowing the way home is a powerful precursor to wayfaring. In this respect the ancient myths, when allied to an ancient precise system of navigation, allow for a powerful anthropological realm of archaeo-astronomical investigation. Significant, seemingly-remote, landfalls are often mentioned within myth and chant. The activities of heroes and heroines are likewise paralleled by the interaction of stars and planets that were once given god-like status. Their movements were pegged out at the perimeters of large inscribed circles (henges) by their priesthood and by repeating these horizon-observed activities using modern astronomical software we can get back into discovering the world the way our

ancestors saw it and understanding the religions that inspired or imprisoned their minds.

Using the Star Pillar to hold Course.

So far we have dealt with the creation of a star pillar. Deviation to north or south of the latitudinal position line it defines will cause that pillar to lean over as, what we term the “clocking star”, (at the base of the pillar), arises or sets within a limited window of observation on the eastern horizon or western horizon. (Limited, otherwise navigational precision becomes likewise limited). The extent to which the pillar leans over at the moment of clocking is a reasonably precise measure of the latitude difference between the vessel and home. If, say, a vessel is at a destination island 5 degrees latitude (300 nautical miles) north of the home position line, the home pillar will be leaning towards the south by 5 degrees and in the Pacific the navigator and crew would know that to get home they must paddle and/or sail in a southerly direction until the pillar becomes erect. In the Atlantic or Mediterranean, the Daanans and Greeks would have needed to row (as distinct from paddle) and likewise sail in a southerly direction to get to the position line leading to their destination landfall. A given star from the star compass can be used to navigate any suitable chosen bearing until the pillar becomes erect and there the vessel will be at a waypoint on the position line. Then the navigator must turn to sail due east or due west along pre-learned star paths to achieve home landfall. (The star pillars defining the latitudinal position lines, although generally east or west, are used primarily to check for verticality not necessarily to steer by).



The possible Advent of Sea Lanes.

Using this technology our modern research has revealed the likelihood of a system of cross ocean latitudinal position line sea lanes in the Ancient Pacific from the Austronesian coastlines in the west to the Americas in the east that were used in the early part of the second millennium. As the above saga from Homer's "Odyssey" illustrated it has also revealed the possibility of similar position line sea lanes in the Atlantic that were used in the 7th Century BC and probably much later until the invention of the compass and the development of scientific charting methods took over. Such sea lanes would have greatly assisted younger navigators in voyage planning and sailing.

Lining up the two stars of the star pillar night after night is, in some ways, no different to correcting course on entering a channel into port and vertically aligning the upper and lower channel lead lights. The difference in the further development of these two systems has led to the historical conundrum in north/south understanding.

Northern Hemisphere System.

In essence, the northern hemisphere system appears to have used Alnilam, the central star in Orion's Belt, as the dominant clocking star. Orion has risen and set in the eastern and western skies throughout history. It is the finest protractor like constellation in the sky. It has given rise to key navigation terminology in most western European languages for "ori" occurs in "origin and original", "orient, orientation and orienteering", "horizon and horizontal". The initial research within Homer's Odyssey led to a chart-in-the-sky for the Atlantic but no such chart has been observed in the Pacific. Our recent analysis of the possible role of ancient Western European henges in defining wayfaring stars suggests that charting started in Western Europe. The Mediterranean and Black Sea portolans that evolved, possibly in Carthage, were the earliest known charts to reveal acceptable standards.



● Contemporary cartographic control points superimposed using the deduced portolan projection.
 Figure 12: The Albini de Canepa portolan 1489. 80 x 120cm, on two sheets of vellum. Courtesy of the James Ford Bell Library at the University of Minnesota, see <http://bell.bl.umn.edu/hist/>

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Southern Hemisphere System.

Investigation into a chant recited by Ruanui of Bora Bora in the early 19th Century and archived in the journals of the Polynesian Society, revealed pairs of stars in the eastern and western horizon windows that successfully explain the Tahitian discovery of Hawaii and Rapa Nui (Easter Island) amongst many other island locations using a generally derived date of 1045 AD. It verified the re-invented star pillar navigation theory that the team had been using as a research tool and highlighted the political relationship in which the exploration navigators were directed by the priesthood along pre-defined sea lanes.

In the Polynesian system each clocking star is different and this precluded the opportunity to form a sky chart. Given the wide oceanic environment with very small land masses in the Pacific there was, in effect, no need to think in terms of charts and herein lies a very important anthropological statement derived from this research that is at odds with some of my earlier assumptions concerning Pacific sky charts.

An Important Anthropological Statement by me, Stan Lusby.

“At initial contact with Europeans, my research indicates that Pacific islanders had not developed the ability to pitch their mind into the sky and look down upon their projected movement as is necessary before a plan, map or chart can mean anything at all.”

(It is accepted that this statement should be contested and open to challenge.)

The overriding arguments for this statement revolve around the manner in which charts and maps have arisen in all world cultures only within the last three thousand years and initially they can be seen to be chaotic. Polynesians have been classified rightly or wrongly as “stone age” based on that classification’s system of useable materials. Significance here in the Pacific is that the absence of metals means that their migration into Oceania out of Asia was essentially one way. The currently held opinion that they came from Taiwan would have placed them in contact with metal instruments for several millennia if two-way contact had been sustained. This proof of isolation adds to my argument.

The Etak Principle.

David Lewis first illustrated the Polynesian navigation principle that has become known as “etak”. In this system the vessel (waka) remains stationary whilst the home island goes astern and the destination island comes towards it. Dead reckoning was clearly confined to holding course in the absence of star pillar updates and time was not specifically connected to distance and hence to the speed of a waka through the water other than in experiential terms. It seems doubtful that instruments like the European log line were used. The log line, although part of the current re-enactment sailing is, like the sextant, merely a device for use in the deployment of nautical charts.

With etak navigation the navigator works from an anthropocentric perspective (self centric) unlike charting where the perspective is earth centric and the navigator a detached witness looking down from on high.

The Interactive Display by Peter Knight.

The interactive display developed by Peter Knight using Molweide’s Homolographic Projection in which latitudes and therefore Polynesian position line sea lanes can be displayed as straight lines illustrates this observation better than words can describe.

A copy of this interactive display is held at the School of Surveying, and can be obtained on request.

The first thing to note is that, as one moves the claw sail representing the waka, it appears to go from Aotearoa to Hawaii locked into the same angular relationship with all the rising and setting clocking stars throughout the entire voyage. Then one needs to realise that the claw sail is not moving at all.

(Certain compromises are necessary to jointly illustrate the European and Polynesian systems and in this interactive display we imply (for convenience) that all clocking is at the same time for all pillars. Clearly this cannot be.)

The fact that a star will rise or set at its same known bearing night after night, (even day after day when sunlight obscures it), irrespective of locality and season, throughout the main human trading latitudes, (away from the poles), gave a secure and sustainable reality and firm base concept for the people of ancient Polynesia to work from and perceive their position in space.

On closer analysis you will see that, when observed from the waka, the upper stars at the capitals of the rotating pillars change their azimuth but no star changes its rising or setting azimuth (bearing) at horizon level.

It is the coastlines and islands that do the moving, (not the vessel or its crew). This is in conformity with the etak principle and the desires of the gods of Polynesia.

This also allows the position line theory to operate in sympathy with the well known star compass. Distance, unlike its role in Cartesian theory, has no influence whatsoever so it holds no tyranny. The entire Polynesian system is one of angular relationships and it is therefore an analogue system. It was Cartesian mathematical theory that heralded the beginnings of the digital age and it is tending to lead us to a loss of understanding of what went before us. The old electronic engineer's maxim: "*Analogue freedoms, digital controls*" holds true. Mankind's ancient dichotomy of freedom or slavery lives on.

Historic Cartography and the Hydrographic Surveying Profession.

In observing Peter Knight's display one must realise that the coastlines and islands are the historic result of the cartographic craft of the hydrographic surveying profession. Captain James Cook was one such member and if one researches the conundrum between him and Tupaia, the navigator priest from Raiatea and the unsatisfactory chart that was compiled by Tupaia and Cook's officers, then one realises that the problem is that both parties, European and Polynesian, perceived space in non-compatible ways. By shutting the coastlines and islands out of the mind, as Peter Knight's interactive display is being shown, and realising that Polynesian navigators sailed using only the rotational characteristics of the star pillars together with the well researched aspects of bird flight, wave reflection etc, one begins to enter into a hitherto all-but-lost world of spatial perception. The star pillars must be perceived as the main teaching device out of which knowledge of the partial rotation of the skies and higher stars above the east and west horizons provided an invaluable addition to the navigator's developing skill. Useful even when the horizon itself was thick with haze and cloud.

Significance of the Polynesian Constellation, Maan.

Maan is first mentioned in David Lewis' book, *"We the Navigators"*. He refers to Maan in a conversation that he had with the navigator, Itilon, from the Micronesian island of Ninigo, which lies on latitude one degree south. (Lewis, 1971 p 247)

"The three stars in line, Canopus (Maanihaiup), Sirius (Maanifono) and Procyon (Maanitola) are together called Maan," said Itilon ***"They are of prime importance in all navigation and they also indicate the direction of the wind."***

Unfortunately heavy clouds obscured the stars during the time Lewis was with Itilon who did his best to explain matters with curved lines in the sand. Itilon stressed the ***"prime importance of Maan"*** in all navigation. Ninigo, north of Papua New Guinea, is regionally within the early Austronesian settlement of the Western Pacific out of which the settlement of what is now termed Polynesia or Oceania began about 3000 years ago. Could this scant reference to Maan be a vital clue to the ancient methods of navigation that facilitated the colonisation of the entire Pacific?

Lewis was baffled as to how the constellation could have anything to do with wind direction. However, Ninigo lies in that equatorial transition zone where a journey north would place a vessel under the influence of the North East Trades for most of the year and a journey south would mean the navigator would have to contend with the South East Trades and then southerly Monsoons around July. In the paper that first broached the position line concept (Lusby, 1998), Maan remained an enigma but subsequent research revealed that the botanist, Joseph Banks, whilst sailing with Captain Cook had kept a log of words that he found common throughout Polynesia and the word "maan" meant bird.

Comment by me, Stan Lusby:

"I had been experimenting with Maan using SkyMap software on the rising horizon and when Canopus, Sirius and Procyon were configured as a bird it became clear that the constellation, Maan, was used as it alighted to the setting horizon".

It is as a bird that the language conundrum between Itilon and Lewis now became clear. Voyaging north or south of Ninigo causes the appropriate wing to be tilted as if blown upwards in sympathy with the dominant wind system that the vessel is sailing in. From this we get the first modern observation that an indigenous navigator was aware of the rotation of the star patterns relative to the eastern and western horizons, whereas a navigator schooled in western scientific, Cartesian reasoning was not.

David Lewis commented:

"My failure to elucidate this (navigation) matter is particularly galling because Itilon was obviously conversant with his facts and had often used the methods he was trying to explain to me on his own voyages."

Lewis again comments:

“We are left with the unsatisfactory assumption that the inconclusive accounts from Samoa, the Tokelaus and Ninigo probably point to the existence of ill-understood high star methods – a reminder of how little is really known about indigenous navigation” (Lewis 1971 p 247)

It is comments like these from a truly great researcher that inspire others to continue for another 43 years in quest of the solution.

Some recent observations concerning Maan.

Maan spans the entire Pacific in the mid-latitude contact regions from Hawaii to Aotearoa. The use of the constellation at Ninigo has never been resolved and it would take a visit to Ninigo in the hope that there is sufficient indigenous wisdom around to solve the ongoing problem, in particular the modern astronomical name and sky location of the Tieti that Itilon referred to. We can observe, using astronomical software, that when Maan, the alighting bird, is used to create star pillars with clocking stars in and around Orion, many different landfalls can be defined.

The Effect of the Earth’s 26,000 Year Cyclic Wobble.

The 26,000 year wobble that leads to the precession of the equinoxes is also responsible for position lines in the current phase of that wobble moving south by about 35 nautical miles per century (in the mid-latitudes) and without regular updates the old position lines have tended to become useless. However, new ones can be selected for the purposes of voyage re-enactments.

Cessation of Polynesian Long-Distance Voyaging.

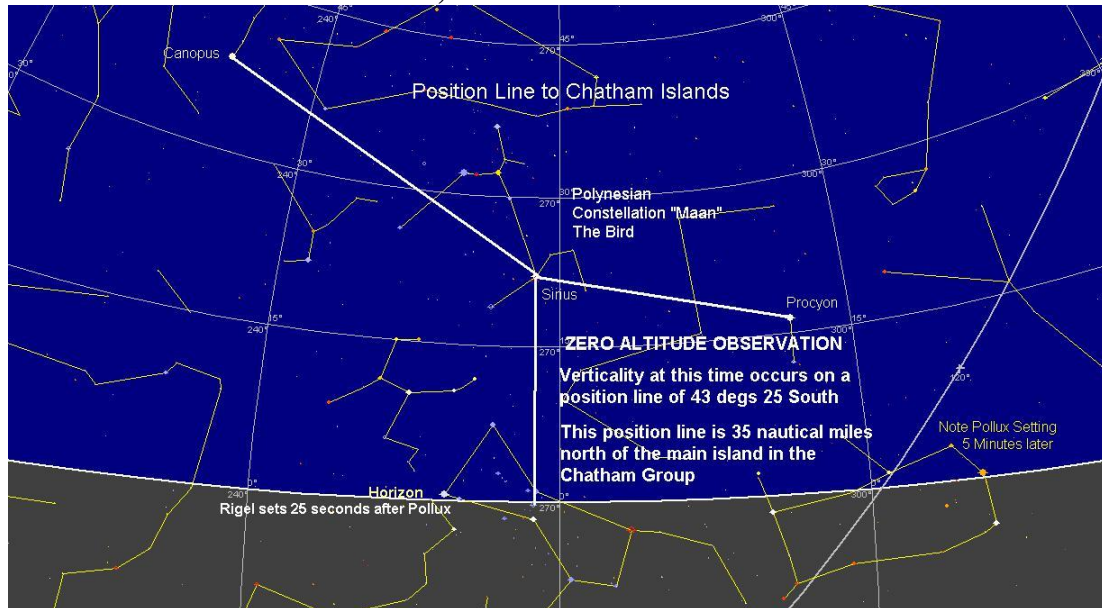
Polynesian long distance voyaging appears to have ended shortly after European contact but the entrenched attitude of the old priesthood could well account for some of the problem. There is currently research into historic Pacific tsunamis and one of these may well have decimated low lying island communities with the resultant loss of life, loss of will power and leadership and the ability to construct ocean going vessels. The navigation secrets were probably held esoterically and the loss of key navigator priests would not have helped and neither would the entry of a new dominant European religion, culture and greed for resources.

If this was not enough for the Polynesian people to endure we can observe that the pandemic caused by the unwitting introduction of European diseases led, more than any other factor, to the decline of the once powerful ancient Polynesia for it was as catastrophic as the Black Death from Asian diseases in Europe several centuries earlier.

The Fate of Rapa Nui (Easter Island).

Islands such as isolated Rapa Nui (Easter Island) appear to have built up large populations when they were key trading nodes on the ancient sea lanes during the great centuries of Polynesian trading. When such trading ceased that island suffered environmental collapse for it could not grow sufficient food on land and the exhaustion of the native timbers for boat building following the loss of imported timber from South America probably led to reduced catches from deep sea fishing and the island appears to have declined into civil war.

Re-Interest in the Constellation, Maan.



Maan has again become the Polynesian constellation of interest. Currently a star pillar formed from Alnilam in Orion's Belt as clocking star with Sirius, the body of the bird called Maan as capital, provides a position line from Christchurch to the Chatham Islands. It was hoped that it could be used to test the re-invented star pillar theory but funds were never forthcoming.

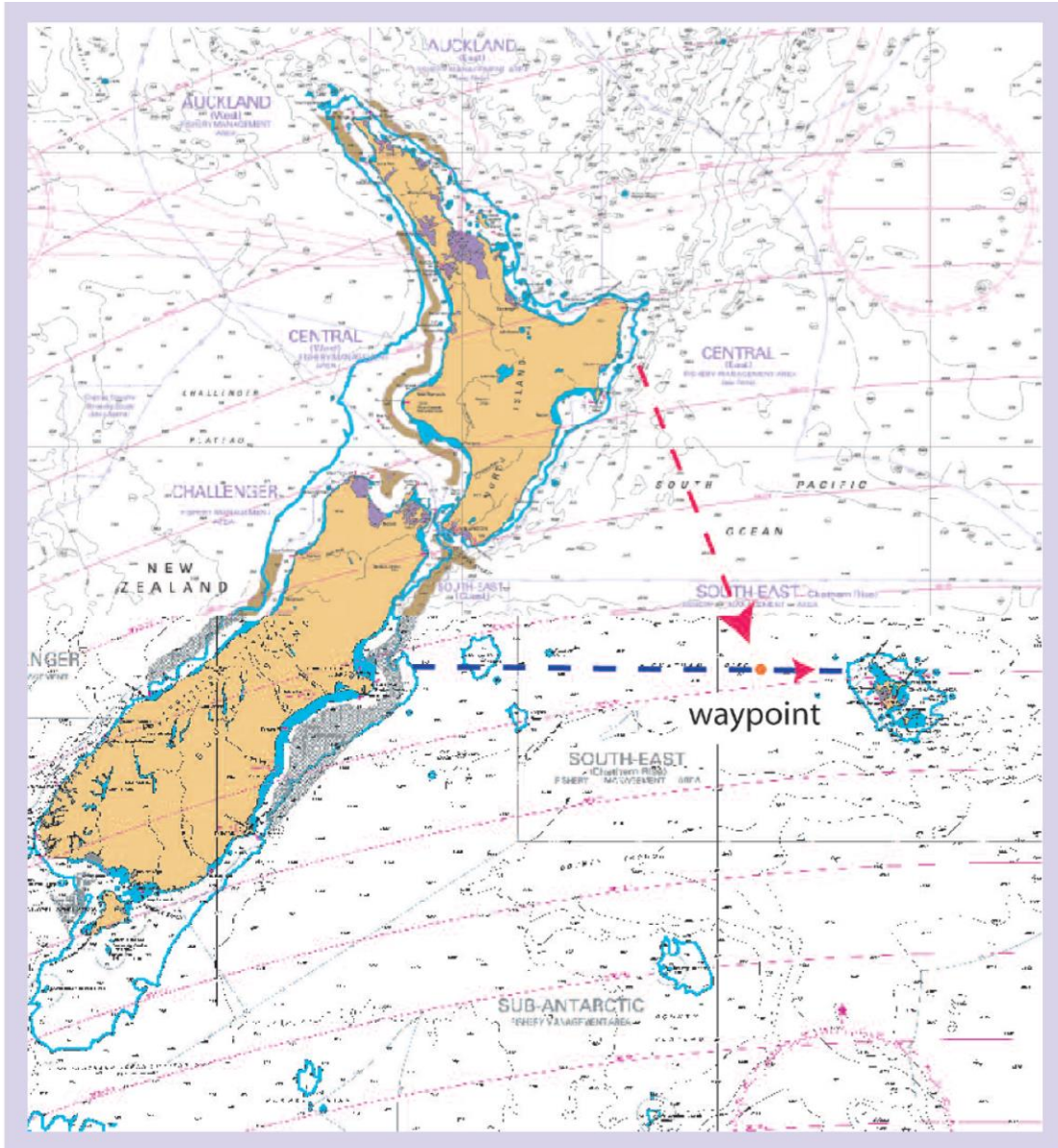


Figure 4: Chart of the sea around New Zealand and the projected voyage south from the East Cape (using the star compass and Southern Cross) to intersect the Chatham Islands Position Line at a waypoint

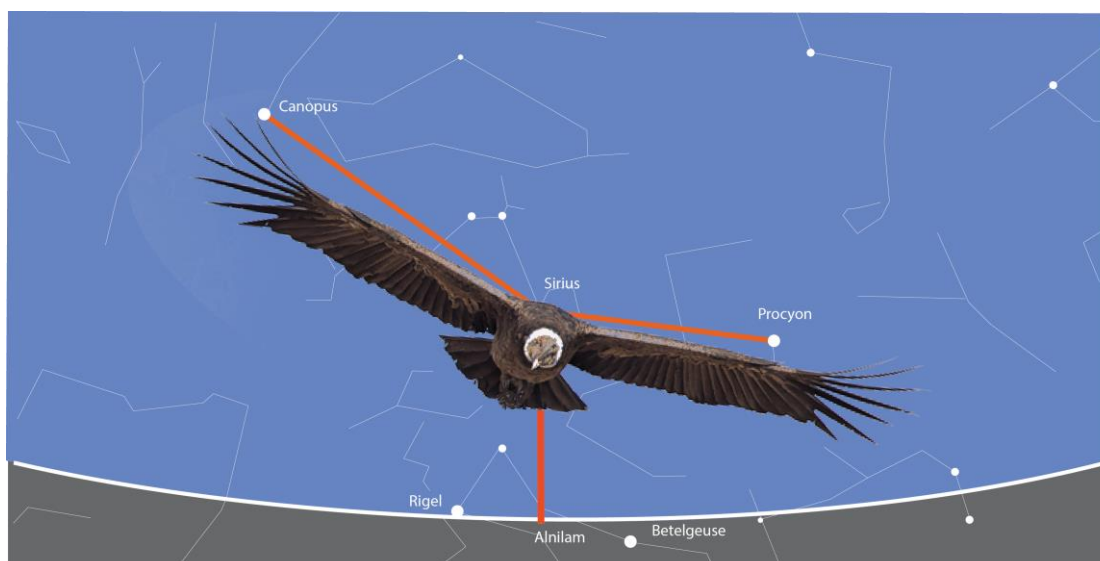
In 2013 a demonstration of Maan alighting with a sea bird superimposed on the SkyMap image of the constellation was shown graphically at a lecture on behalf of the University of Waikato and it aroused interest amongst elders of the Te Arawa and Tainui iwi (tribes) who were present.

Determination of Ancient Maori Waka Landfalls in Aotearoa.

Professor Paul Tapsell of Te Tumu, School of Maori, Pacific and Indigenous Studies at the University of Otago has provided me with evidence that the waka, *“Te Arawa”*, made landfall at Maketu in North Island, New Zealand aided by a *“Standing Bird”*.

On the date given for the arrival of that settler waka, SkyMap software has revealed that Maan was at that very latitude as defined by the star pillar formed from Alnilam in Orion’s Belt as clocking star and Sirius, the body of the bird, as the capital of the star pillar vertically above it.

Paul Tapsell has advanced expertise in Polynesian languages and “*tu*” can mean “stand” and “*make make*” can be shown to refer to a large black bird. Ancestral lore in the Tuamotu Archipelago, which is well within the close contact region of Tahiti and Raiatea, where the Te Arawa people are said to originate, refers to such a bird. There is no such bird in the islands now but known contact with South America plus the ability of a certain extremely large South American black bird to fly the distance to the Tuomotus (much as Thor Heyerdahl and his team sailed to them on the balsa raft “*Kon Tiki*”), favours the Andean Condor. We have been pleased to review the situation and fellow hydrographic surveyor, Peter Knight, has provided an excellent picture of a condor superimposed on Maan as it appeared over the New Zealand township now known as, Maketu (“*Make-tu*”), in the early centuries of the last Millennium.



The star pillar formed from Alnilam and Sirius is vertical as Maan stands on the horizon at latitude 37 degrees 48 minutes (South), beckoning the Te Arawa to make a landfall.

In conclusion.

Avenues for Future Research.

Blue Water Trials

The star pillar theory, has not been tried and tested at sea so many of the foreseeable practical problems such as horizon visibility, light pollution, refraction and holding course between star updates needs to be researched and conquered along with other, as yet, unknowns, not least of all funding.

Intuitive or Intellectual Sense of Direction?

It was widely recorded that, Tupaia, the priest/navigator could, whilst sailing with Captain Cook, turn and readily point in the direction of his home island of Raiatea and boys on missionary vessels were known to do the same thing. This must have been relatively easy but our Cartesian concepts are still blinding us to knowing how. At best, I could point to a distant home pillar and say how many degree of latitude one would need to travel north or south to get to its latitudinal position line but the bearing to the island could lie anywhere on an arc of 90 degrees and, unless a bearing had been iteratively derived from multiple sailings there is no way I would know which way to point. This is, in effect, the Polynesian equivalent of the European “longitude problem”. Intuitive aspects of time travelled could well help if the observer had accumulated the number of days he or she had sailed along with Ra (The Sun) or against him but this would not be very precise. Further understanding of the etak principle seems to lie at the heart of this research.

Analogue Advantages

It is well known that when the first digital wrist watches came out they were not successful. 3.45 p.m. is all very well but it takes a convoluted thought process to determine where that time stands in relation to breakfast, lunch, hometime etc whereas an analogue clock face gives all this information at a glance for it simulates the northern hemisphere passage of the Sun from rising to crossing the meridian at midday and then sunset with all events in between. A situation referred to as “*from the whole to the part*”. The watchmakers solved the problem by returning to the analogue watch face with hour and minute hands and peripheral hour and minute divisions but with the overall improvement in precision in that the hands were controlled by digital technology and the analogue display was, once again, readily sympathetic to the superior human analogue audio/video receivers of our eyes and ears.

In star pillar navigation, the precision and amount by which the pillar rotates about the east or west clocking star rising or setting points, is controlled entirely by the vessel’s change in latitude. If the voyage has latitudinal and longitudinal components then a rotation between the home and the destination angles of the star pillar by, say, two thirds of the total will, by similar triangles, mean that 66.6% of the journey has been completed (at least as far as the waypoint) and also that 66.6% of the longitude and latitude components have also been realised. The ancient navigators, in having a dial that told the fractional amount of voyage completed, had no need of knowledge concerning latitude and longitude. It meant nothing to him or her but it does explain to us why the system was so successful. The rotation of the star pillar obeys the analogue “*whole to the part*” relationship in a way that the digital never can. It is, however, not so useful in determining how much voyage remains on a purely east-west passage. Distance would only have been seen in terms of sailing days.

The Juan de la Cosa Portolan 1500 AD

For Survey Schools some research into Mediterranean and Black Sea portolan charts would be worthy of a Doctorate. Given the recent supposed discovery of the “Santa Maria”, the flag ship of Columbus, the time is right. The compiler of the seriously distorted first map of the North Atlantic in 1500 AD was Juan de la Cosa, the Basque owner of the Santa Maria, who sailed with Columbus in 1492 AD.



Figure 15: World map by Juan de la Cosa, 1500AD. Note that what looks like the Gulf of Mexico is not. All points west of Florida have been distorted and lost at the extreme western edge of the Earth disc.

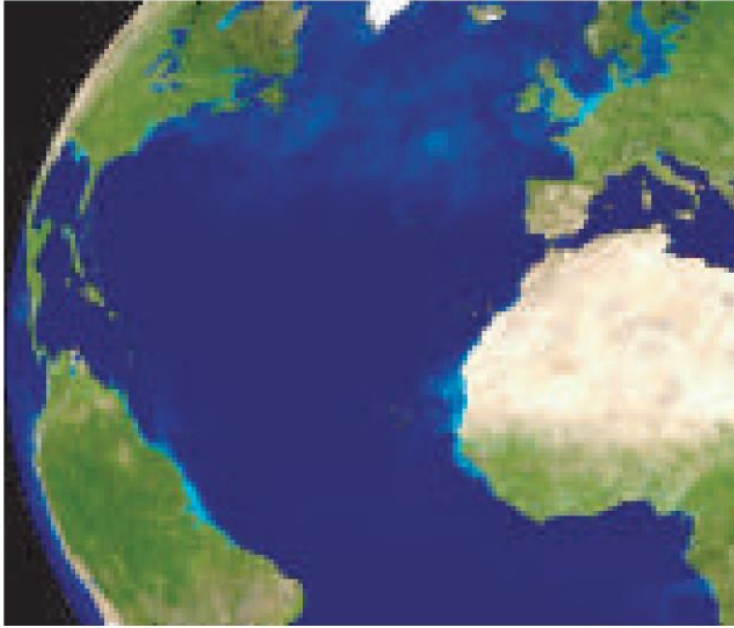


Figure 13: NASA/Fourmilab image of Earth disc (viewed from the distance of the sun) showing the east coast of the Americas centred at $23^{\circ}30'N$, $10^{\circ}00'W$.

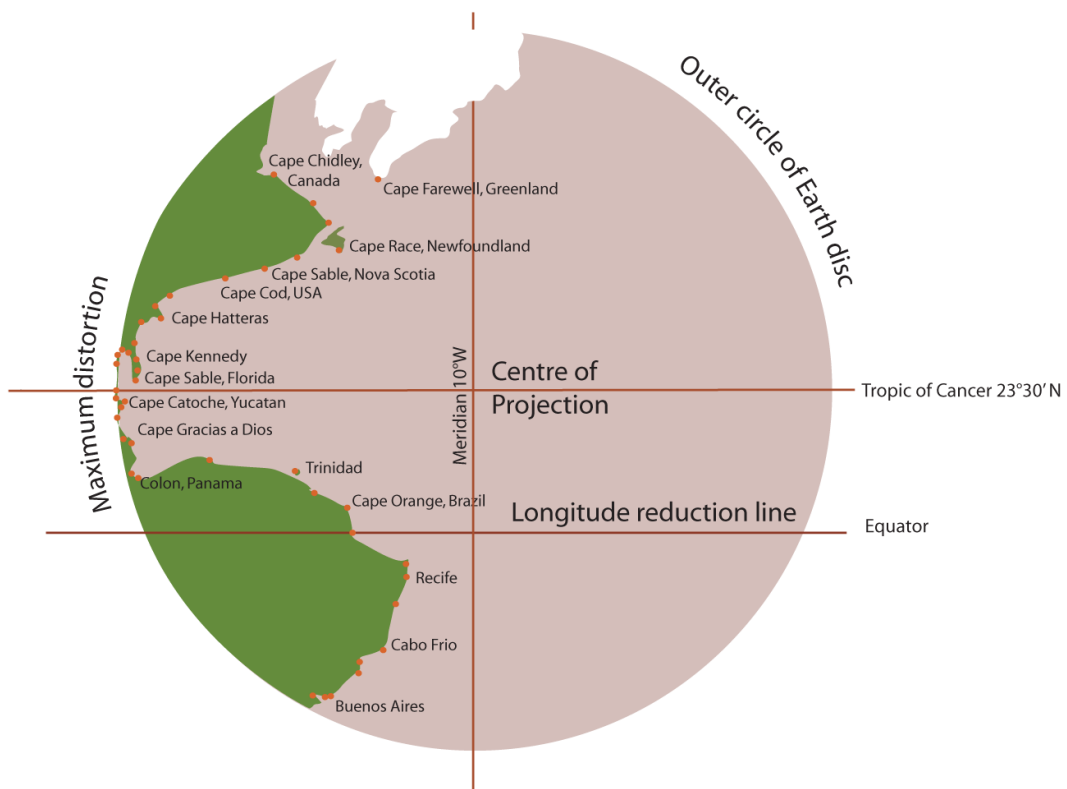


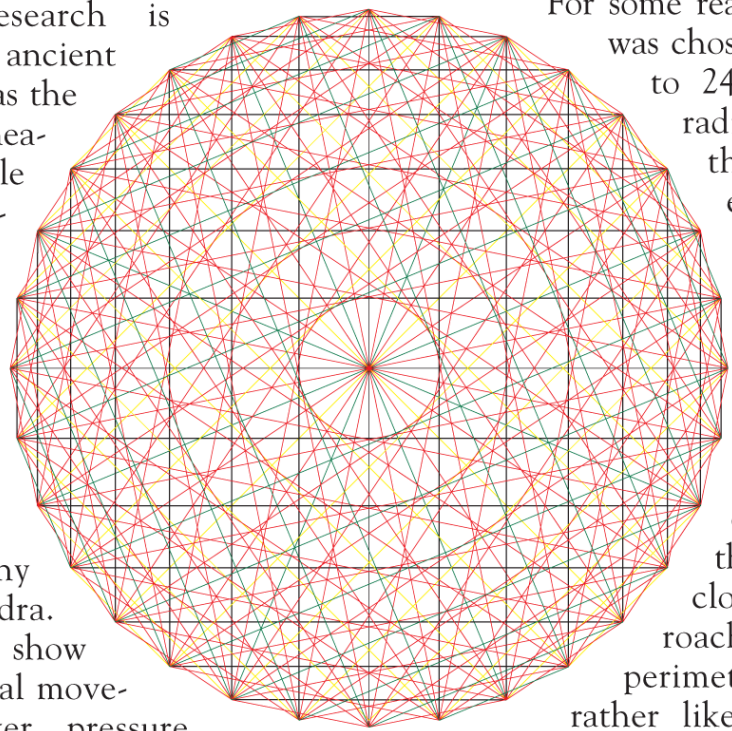
Figure 14: Simulated east coast of the Americas on a deduced portolan projection centred at $23^{\circ}30'N$, $10^{\circ}00'W$

Our Otago team proved that the cartography is seriously at fault for it extended out of its Mediterranean base beyond the limits of its projection capabilities. A detailed analysis could well prove that the survey of the North American Atlantic coast by the

Cabots on behalf of their English sponsors was, in fact, far better than the de la Cosa map suggests. By selecting a new centre of projection and using the basic portolan projection characteristics that we re-derived plus survey data derived from the now accepted coastline, such a re-construction could well enhance the worth of this otherwise fine old chart in the eyes of both American and English historians as well as re-highlight one of the finest projections I have ever come across.

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The Portolan Radial Grid



Vesconte and his Large Table.

Final Philosophical Rumblings

One of the most important advances of our species giving us an advantage over other species occurred 5 million years ago with the development of our thumb and fore finger acting in opposition. If one looks for a subsequent technical advance having great effect on our species control of its destiny the one provided by the attribute of pitching the mind into the sky and looking down on our projected movement has provided the key. It was not a physical development. It is difficult to assign its origin to logic or reason for its source would appear to be more spiritual than intellectual.

The Origin of the Concept of Planning.

The ability to go out into the macro environment, survey and map it and then return and present a picture (plan) of that environment at a micro size that can be accommodated by the human eyes, at a glance, viewing it on a desk or a computer screen facilitates re-design of that environment by what became known as planning. The ability to then take the design parameters of the proposed new environment out into the macro world and set them out for the purposes of construction, points to the anthropologically significant power obtained by pitching our minds into the sky. Within the micro environment the microscope provides for the reverse process).

These realisations demand a lot more research from institutions with financial backing for, anthropologically, they are essential to understanding ourselves as a species. Polynesia, through its isolation, has taught us a valuable lesson. The star pillar theory has revealed surprising results when used to analyse the Homeric myths that need more in depth analysis using astronomical software.

We can greatly admire the way in which Polynesian vessel technology is being deployed throughout the world and how their navigation processes are now assisting transportation through a graphical display on GPS screens that successfully combines scientific mapping with etak navigation principles. Indeed, modern computer graphics could not have progressed without programmers knowingly or unknowingly applying etak principles and through this we can observe the once divisive European and Polynesian dominant perceptions of space now acting as one.

Stan Lusby
Moeraki June 2014

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