Neolithic People

Body, Mind & Spirit

Ancient Heritage of Surveying

Terry Ryan

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Homo Sapiens first migrated to Europe, Asia, Australia and Americas, some 60,000 years ago.[1] The Neolithic Period began c. $10{,}000_{BCE}$ and Neolithic people first arrived in Europe c. $5{,}000_{BCE}$; it was the beginning of mass agriculture, domesticated animals and settlements throughout the world.

Neolithic people were part of a time period, rather than from a place. They laid foundations for mass produced agriculture and inventions: pottery/cart wheels, canals, boats, metallurgy, polished stone tools, writing and surveying practices.[2] The discovery of *Plimpton 322 clay tablet* recorded the use of *right-angle* triangular ratios, plumblines, gradient ratios and horizontal distance measurement.

Transport was transformed, pottery mass-produced, security of food/water greatly improved with gravity-fed waterflows for storage, distribution, irrigation and food *(fish-traps*). Writing enabled accumulated records (*seasonal events, empirical observations*). Accumulated records scribed on hard-baked tablets provided newfound archaeological evidence of the Neolithic period.

Today, poignantly broken tablets, shards of pottery and remnants of structures provided history-changing archaeological artefacts of a previously unknown prehistory. Rather than limited primitive skills, Neolithic people provided extraordinary creativity, knowledge and innovation rather than the limited *silo-beliefs* tied to nature, survival, deities and primitive abilities portrayed by earlier histories.

[1] BLOSSUM, Jeff. 2016. *"A walk through time - Map"* Centre for Geographic Analysis, Harvard University. USA.
[2] CALDWELL, Wallace Everett. 1962. *"The Ancient World."* P 1-16.

Neolithic Dawn

Ancient flight of ibises,
Migrating to other places.
Multifarious dispersal,
collisional, respirational,
wandering, bliss and bale.

Nature’s teaching, listening to rivers,
Creativity, secrecy and deities,
Drivers of change: hunger, thirst, pain,
foundations of greater consciousness.
Solving mysteries, driven to roam
Waters of life, lured by unknown,
Taking steps, finding home…

***

Foreword

Millennia have passed since the introduction of writing. However, little is known of unrecorded times called prehistory or more accurately preliterary history. The fundamental sources of knowledge of that time rely on material artefacts, remnants of buildings, monumentation and interpretations of culture.[1] Historical narratives frequently describe customs and outdated preconceptions of categorizing people as primitive. Assertions that people remaining in primitive stages are subjective with little or no evidence. Supposed scholars have been openly skeptical of *so-called* primitive people without understanding their survival skills with catastrophic droughts, floods and earthquakes during the Bronze Age (c.1,200-1,150$_{BCE}$).[2] Historians must consider survival is the basis for settlement, social cohesion, agricultural skills, knowledge of natural events/patterns, seasons, periods of time for crop cycles, food and water security.

Recent archaeological discoveries have proved previous prehistory assertions are *inadequate or unsatisfactory.*[3] Rather than classifying prehistory people as primitive, consider their resilient survival skills, knowledge of nature, creativity and roles as *Food Gatherers, Food Producers* and *Craft Makers.*

Recent discoveries of pottery and tools have challenged preliterary histories and have redefined the Neolithic period. Artefacts included evidence of polished stone implements, inventions, metal-working tools mastering the use of copper, tin, bronze and iron metals. Recent archaeological evidence identified intangible evidence of Neolithic people's creativity extended to literature, artistic objects/artefacts, mathematical concepts and complex surveying practices involving plumb-bob *(plumbline),* horizontal plane in relation to gravity, square (*right-angle*) for construction and water-flow infrastructures.[4]

[1] CALDWELL, Wallace Everett. 1962. *"The Ancient World"*. P 1.
[2] CALDWELL, Wallace Everett. 1962. *"The Ancient World."* P 4.
[3] CALDWELL, Wallace Everett. 1962. *"The Ancient World"*. P 1.
[4] MANSFIELD, D. F. 2020. "*A Study of Rectangles."*

Understanding verticality of a plumbline was further evidenced by the discovery of an AKKADIAN word, *MUTARRITTOM* (c. $2{,}360_{BCE}$) meaning plumbline (*direction of gravity*) or verticality. [5] (Figure A)

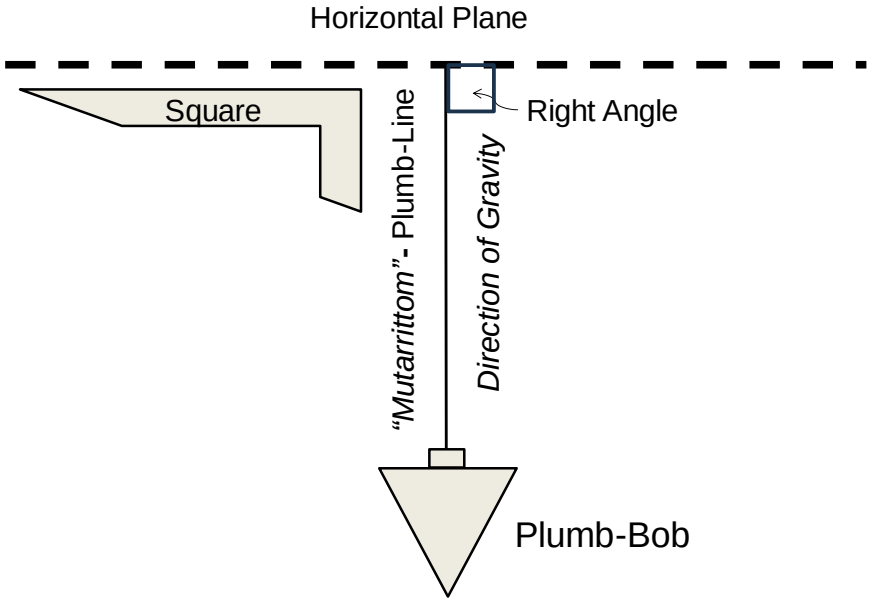


Figure A: Defining the Horizontal

Source: Terry Ryan
TAFE Applied Mathematics, 2016

Archaeological findings from clay tablets recorded the use of *right-angles* in relation to triangular ratios. It is thought, surveying skills and practices developed from empirical observations guided by spiritual beliefs associated with Tigris and Euphrates Rivers.[6]

The Tigris and Euphrates Rivers were regarded as the source of knowledge, beliefs and customs during 2nd and 3rd millenniums BCE. Both rivers were revered as divine entities. Understanding *still-water/river flows* was likely attributed to divine intercession. The concept of the horizontal in relation to water-flow may have been considered as *divine knowledge*.

[5] MANSFIELD, D. F. 2020. "A *Study of Rectangles."*
[6] PERDIBON, Anna. 2021. "*Between The Mouth Of The Two Rivers.*" Etnološka Tribina 44, Vol. 51.

The invention of tools, writing and discovery of recent artefacts demonstrated a mathematical prowess involving cuneiform numbering system, horizontal distance measurement and unitary surveying practices with right-angled geometry and the horizontal plane associated with sophisticated cultures

> *Neolithic history ended prehistory period, starting a new literary period.*

Acknowledgement

Surveying is an enduring culture involving hard physical field work, measurement practices, calculations, shared knowledge and mentoring. Henry Werner a renowned *thinker,* was drawn to societal questions. He postulated a philosophy of progress demands researchers and scientists to ask themselves: *does my research serve the progress of mankind?* A question relevant today, as it was in Aristotle's time. Henry believed part of the answer involved pursuit of knowledge and its spiritual value. [7]

Today, *Old Lands Department Surveyors* (OLDS) gather to recall experiences*,* maintain friendships and *keep-in-touch* with the profession. For them, heritage of surveying includes provenances: knowledge, technology, skills and heritage that tends to repeat itself:

Not so long ago…

> *Surveyors behind theodolites, booking measurements, holding steel-band readers with 16-pound tension for proper sag correction, reading a thermometer for field temperatures, recording measurements, directing a survey party, clearing lines with brush hooks and axes. Field-hands held the other end of the steel-bands, cleared traverses, cut waddies, built rock-spits, broad-arrowed pegs and blazed trees in the course of carrying out a survey instruction.*

[7] THOMAS, Warren. 2024 *"Henry, Me and Philosophy."*

Quite some time ago…

> *Babylonian rope-stretchers and scribes used ratios to set-out gradients for structures based on right-angle triangular properties with two known sides, namely, rise/fall and horizontal distance. Horizontal distances were based on using a plumb-line at right-angle to a measuring tape. The practice emulated a right-angled triangle where two sides were measured in relation to the plumb-line ensuring horizontal distances and rise or fall from the horizontal.*

My thanks to Surveyors and Field Hands who contributed to surveying's heritage through their outstanding achievements and steadfast professionalism.

James Hammond	David O'Keefe	Graeme Hissey
Ken Green	Bill Kelly	John McLean
Gary Cooper	Jim Perryman	Jack Darby
Allan Stephens	Charles Champion	Kevin Hopkins
John Wallace	Phil Edwards	Bob Hunter
Paul Callaghan	Lance Scrivener	Steve MacDonald
Ashley Furner	Ron Benjamin	Ken Graf
Ian Sheerin	John Osmond	Bob Fish
John Eggleston	Steve Broughton	Tony Robinson
George Spink	Ron Lister	

My personal thanks to Shadia Majed and her team at Hungry Spoon Café, Oatley, who lifted my efforts during a challenging time with understanding and quiet encouragement. Shadia's knowledge of cultural traits provided a generational insight of the lasting qualities of Mesopotamian culture. A history of survival, extreme disasters, floods, droughts, starvation, earthquakes and a resilience for future generations.

> *Belonging… a potent sense of a past with unshakeable sagacity of faith nourishing life, place and family.*[8]

***

[8] RYAN, Terry. 2021. "*Poetica*" Oatley, Australia.

Neolithic People

The Neolithic (New Stone Age) period begun as far back as 10,000$_{BCE}$ and when Neolithic people arrived in Europe c.5,000$_{BCE}$. However, these dates depend on historical sources and geographical regions. Neolithic period marked beginning of agricultural life and settlements throughout the known world[1] particularly, river valleys of the Nile, Tigris, Euphrates, Indus, Ganges, Huang He, Yangtze Rivers.[2,] The flooding of these rivers gave rise to new-found knowledge associated with mass settlement, agriculture and greater skills. Neolithic people belong to a period of time, rather than from a place. They laid foundations for mass agriculture and inventions that included pottery/cart wheels, canals, boats, metallurgy (*tin, copper, bronze*), polished stone tools and writing.[3]

During c.7,500$_{BCE}$, Neolithic people first arrived in Mesopotamia with domesticated animals leading to settlement and mass-produced agriculture in *The Fertile Crescent,* later known as *the cradle of civilisation.*

Semites, Samerians and Akkadians developed settlements leading to future city-states. Babylon located on the lower Euphrates River was founded c.1,894$_{BCE}$ and later, regional capital of Mesopotamia. The Neo-Babylonian Empire was established c.700-600$_{BCE}$. Babylonia became a cultural region and abandoned 1,000$_{CE}$ when divided into two countries: Sumer (*southeast*) and Akkad (*northwest*) within ancient Mesopotamia. (Figure 1)

[1] PASCOE, Bruce. 2014. *"Dark Emu, Black Seeds: Agriculture or Accident?"*
[2] CALDWELL, Wallace Everett. 1962. *"The Ancient World"*.
[3] CALDWELL, Wallace, Everett. 1962. *"The Ancient World."* P 1-16.



Figure 1: Neolithic Period c. 7,500 BCE
Mesopotamia, *The Fertile Crescent*

Source: Wikipedia 2026

The discovery of Plimpton 322 clay tablet recorded the use of paired *right-angle* triangular ratios, verticality of plumblines (*direction of gravity*), gradient ratio (*rise/fall over a horizontal distance*) and right-angle triangles. [4, 5] Stand-out mathematical concepts involved right-angles, plumblines (*direction of gravity*) applied to horizontal distance measurements.

These mathematical *break-throughs* challenged previous histories of so-called *primitive* human skills. Recent artefacts

[4] A right-angled triangle with sides (a, b, c) where c = hypotenuse, $c^2 = a^2 + b^2$, gradient ratio (m) = a/b, where a = (rise/fall) and b = (horizontal distance).
[5] MANSFIELD, D. F. 2020. "*A Study of Rectangles.*"

confirmed sophisticated inventions and precise distance measurement during the establishment of settlements and mass-agricultural practices. Invention of the *wheel* transformed transport, building, goods, services and importantly, the pottery-wheel. That mass-produced earthenware for food/water storage, staple grains, oilseeds, field crops and livestock feed for domestic animals. The development of *water-flow* skills for irrigation, distribution of water led to gravity-fed irrigation and mass-agriculture. Advances with *numbers* led to writing and accumulation of knowledge Three skills: *wheel, water-flow and numbers* effectively changed tenuous settlements into formidable city-states.

Nature's spiritual influences were gradually lessened with growing knowledge and accumulation of records. The source of knowledge was increased by the widening roles of deities with human leadership. (*God-Heads: Pharaohs, Emperors, Kings, Chiefs*) As communities became sedentary, settlers gradually turned from appeasing nature's destructive forces to mollifying spiritual deities and earthly rulers who governed with sovereign authority.

The invention of writing ended the prehistory period. Poignantly, the discovery of broken clay tablets, shards of pottery, remnants of standing structures provided irrevocable archaeological evidence for changing prehistory perspectives and acknowledging the heritage of the Neolithic period.[6]

> *"No ritual was too exacting, no sacrifice too great to secure good will of divine beings who gave grain."* [7]

During 2020s, archaeological discoveries in Türkiye's south-western plains revealed further understanding of Neolithic people 11,000 years ago. Discoveries found in the *Upper Mesopotamian* area included stone human figures with

[6] TABARROK, Maxwell. 2022. *"Mathematics in The Neolithic Revolution"*. Maximum Progress.
[7] CALDWELL, Wallace, Everett. 1962. *"The Ancient World."* Pp 15-16.

expressive carved faces, stitched lips and adorned with serpentine beads. The statures provided further insight into prehistory beliefs and rituals. It is thought from the number of human sculptures, it reflected a settled life.

Egyptian hieroglyphic script developed during c.3,000$_{BCE}$ were influenced by Mesopotamian writings recording calendars, spiritual scripts, labor force, water infrastructure (*canals, sluices, storage*). Writings formalized credibility, authority and control of human labor. Writings largely involved food production, water consumption and presumedly, transactions involving massive benefits for rulers and administrations.

The *Rhind Mathematical Papyrus* is an example of mathematics dating back to 1,500$_{BCE}$. The original document contains 87 problems including algebra, geometry and examples of shares of grain between workers and landlords, volumes stored in silos, areas of land and units of measurement. (Figure 2)



Figure 2: The Rhind Mathematical Papyrus, 1,500$_{BCE}$

Source: Pharoh Ramesses II
Luxor, Egypt

During the prehistory period, Euphrates River flowed through Babylon divided into branches and canals for water supply and irrigation of crops. *Babylonian flow* was a term describing the normal rate of water-flow. The rate of water-flow was found by measurement of the horizontal distance and *rise/fall* between measured points. The ratio of the rise/fall and distance defined the gradients for different rates of water-flows. Determining the rate of water-flow was based on repeated observations, and recorded on clay tablets, riverbank marks or gauges. The records of *Babylonian flow* were similar to Egyptian *Nileometer* records of water clarity, events (*flooding, rate of water-flow*), *rise/fall* of river levels at different times. (Figure 3)



Figure 3: Egyptian Nile River Records: *Nileometer*

Source: Unknown

Babylonians mastered water-flow by using gradient ratios and records of seasonal events. Building water infrastructures was based on accumulated knowledge from records of canals,

aqueducts, water storage, irrigation and distribution. Efficient water-flow required accurate location, precise distance measurement and fall/rise between points.

Neolithic people brought worldly knowledge to Mesopotamia, accelerating Babylon into an advanced city-state. Achievements included inventions: free-turning carts/pottery wheels, grain threshing sledges, water supply, storage, distribution, irrigation, pottery, writing and complex works. Creativity extended to great works of literature, artistic objects, artefacts and original mathematical practices for future civilisations.

Neolithic people invented agricultural implements for agriculture and keeping of domesticated animals. Sophisticated tools included stone plumb-bobs (*highlighted*), hammer, hoe, pick, knives and sharpening stones for carpentry, pottery, weaving, baking, fencing and smelting of metals (*tin, copper, bronze*). (Figure 4)



Figure 4: Assortment of Neolithic Stone Tools

Source Internet

Sumerians pressed cuneiform characters into wet clay tablets recording transactions, measurements, including the symbol for zero. It is thought, the first time zero was ever recorded.

The cuneiform accounting tablet included quantities of notations for malt and barley grouts connected to annotated numeracy considered as the earliest form of writing. c.3,100-2,900$_{BCE}$. (Figure 5)



Figure 5: Cuneiform Accounting Tablet

Source: Metropolitan Museum of Art, N.Y.

It is thought, the invention of writing stemmed from annotated numerals/symbols attached to numerals. (Back Cover)

Sumerian Accountants laid the groundwork for writing with a sexagesimal numerical system tied to transactions and annotatable numerals/symbols led to recording events, calendars, laws, weights and measurements. Writing accelerated Babylon's level of civic sophistication, influence and dominance in the Mesopotamian region.

Cuneiform is the earliest known writing system developed from Sumerian and Akkadian languages of southern Mesopotamia during 2,900$_{BCE}$-100$_{CE}$.[8] Cuneiform, described as a syllabic writing system involving several languages during c.1,200-1,150$_{BCE}$ and the next three millennia. (Figure 6)

[8] Sumerian Inventions and Myths: Writing, Wheel, Lyre, Drainage Systems, Dams and Legal Code; Myths of Great Flood and Creation.



Figure 6: Cuneiform Characters
Southern Mesopotamia c. $2{,}900_{BCE}$-100_{CE}

Source: Unknown.

Deities of various city-states originated from local Mesopotamian beliefs and divinities. Human spirit grew from necessities of life reflecting nature's *wholeness* described as *body, mind and spirit.* Human spirit is believed to be manifestation of life forces by deities responsible for humanity.

The *human spirit* of the Neolithic people was expressed in terms of human qualities, knowledge and nature. The notion of spirit involves *the unknowable* and acceptance of being part of the vast universe. The Neolithic Period was a time when places were foundered by gatherings of people striving for survival and seeking understanding of place in an unknown world thought to be made from four elements: earth, air, fire and water. Early spiritual beliefs accounted for survival and safeguards against nature's destructive forces. It was the spiritual forces that led to human deification of rulers with deities. Spiritual association with

deities increased authority and power of kings/emperors/queens as earthly *God-figure heads* responsible with deities for governance of *people, rivers, canals, droughts, floods and earthquakes.*[9]

Spiritual Deities

Rivers, canals, springs, marshes and underground waters were prominent topographical features of the Mesopotamian spiritual order. Tigris and Euphrates Rivers were shaped by beliefs, concepts and practices during 2nd and 3rd millenniums BCE. Rivers played dominant roles as sources of life, abundance, salvation but also death, disease and punishment.[10] The connection between knowledge, nature and anthropomorphic deities, partly explains intimate drivers behind acceptance of change at different times. (Figure 7)

Deity	Roles
Marduk	Patron god of Babylon, supreme ruler of Babylonian gods, mythology.
Enki	God of southern sky, creation first humans, sweet waters, wisdom.
Nergal	God of death, pestilence and plague.
Enlil	A powerful god of wind, air, earth, storm, agriculture.
Anu	Sky god, father of gods, presided over heaven.
Inanna	Goddess of love, fertility, war.
Utu	God of the sun, justice, truth.

Figure 7: Mesopotamian Major Deities and Roles

Source TAYLOR, Vanessa. 2025.

[9] CALDWELL, Wallace, Everett. 1962. *"The Ancient World."* Pp 31-37.
[10] PERDIBON, Anna. 2021. "*Between The Mouth Of The Two Rivers.*"

Mesopotamian prehistory involved creative human innovation with tools, knowledge and mathematical concepts; it was the prelude for future civilisations. Change brought intangible values: enlightenment, *a*ccumulated knowledge, food/water security, slavery, warfare and greater human consciousness.[11]

> *Community safeguards were essential for the protection of divine mysteries, preserving knowledge, power, control and survival.*

Mathematical innovation reflected greater creativity largely driven by survival needs. For example, understanding early circular shapes were progressively refined leading to well-defined circular wheels and understanding of geometrical properties. Fundamental properties of circles were further refined by observations of nature and practical use. The significance of circles was a prelude to understanding divine universal values through perfection of shape as a *transcendental trait of truth, beauty and goodness* Rather than deductive reasoning; it is thought, the practice of repetitious empirical observations validated procedural knowledge inspiring innovation and institutional order. The methodology involved t*rial-and-error* techniques until repeatability of results provided a level of proof recorded on wet clay tablets for future reference. The accumulated knowledge of past events led to progressive innovation improving food/water security, human labour and creativity.

> *“Surviving uncertain futures required inspiration preparedness, innovation and knowledge.”* [12]

Recovery from natural disasters; droughts, floods and earthquakes during the Bronze Age was driver of change and new perspectives. (c.1,200-1,150$_{BCE}$)[13] Recently found artefacts

[11] RYAN, Terrence. 1988. *“Keepers of the Great Southern Consciousness.”* NSW The Anthroposophical Society Journal. Sydney, Australia.
[12] Author Notes. 2025.
[13] CALDWELL, Wallace, Everett. 1962. *“The Ancient World.”* P 4.

confirmed accuracy and practicality of empirical observations associated with distance measurement and right-angle geometrical problems. The 1969 discovery of a 3,700 years-old Babylonian clay-tablet, known as Plimpton 322, confirmed numerical measurements of *paired right-angle triangular ratios were* used during that time.[14]

From a surveying perspective, recent artefacts confirmed the use of horizontal distance measurement, plumb-bob for the direction of gravity and connection with right-angle triangular geometry suggesting surveying as profession began some four thousand years ago. (Figure 8)

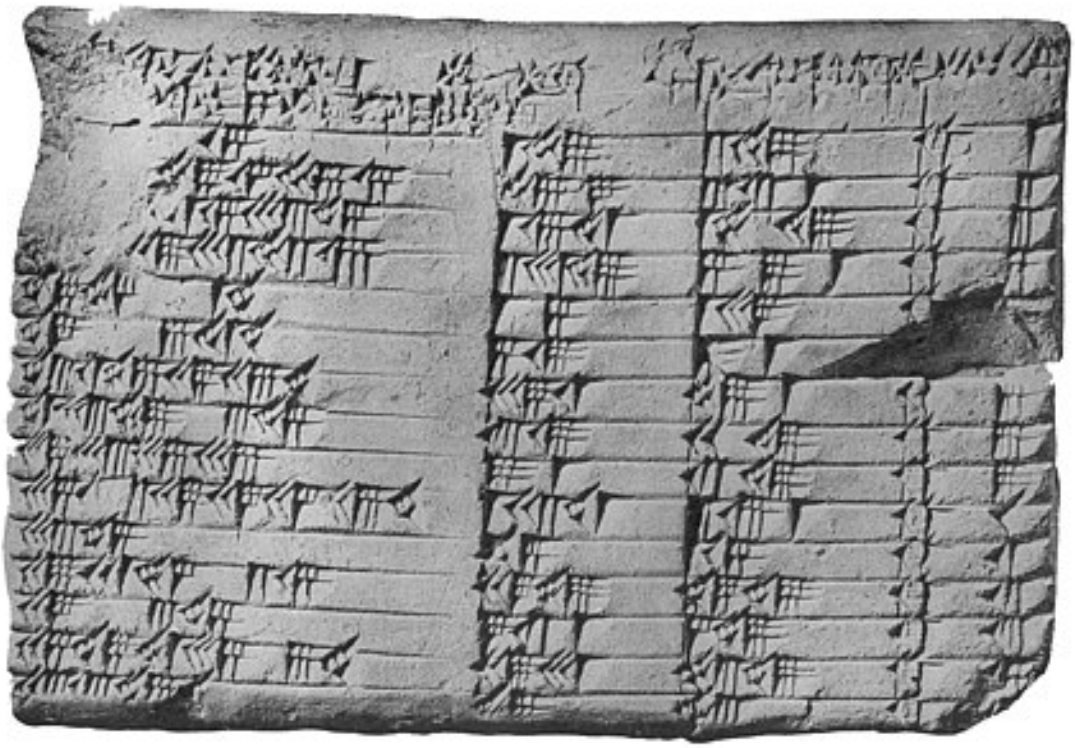


Figure 8: Plimpton 322, Babylonian Clay Tablet c.1,900-1600BCE.
"Fifteen rows describing 15 right-angled triangles with decreasing gradients."

Source: Plimpton Collection
Columbia University

[14] PYTHAGOREAN TRIPLES shown in the Plimpton Clay Tablet systematically lists 15 pairs of integers (a, b), part of Pythagorean Triples (a, b, c) used in the equation $a^2 + b^2 = c^2$.

Plimpton 322 tablet dates back to c.1,900-1600$_{BCE.}$ A broken clay tablet containing history-changing cuneiform numerical imprints confirming use of right-angle triangles and rectangles.[15] Despite its broken appearance, the tablet revealed a sophisticated level of mathematics that challenged previous histories. Analysis of the tablet suggests it may relate to the development of plane trigonometry. However, its main significance rests with right-angle triangular relationships, direction of gravity and horizontal distance measurement. (Figure 9)

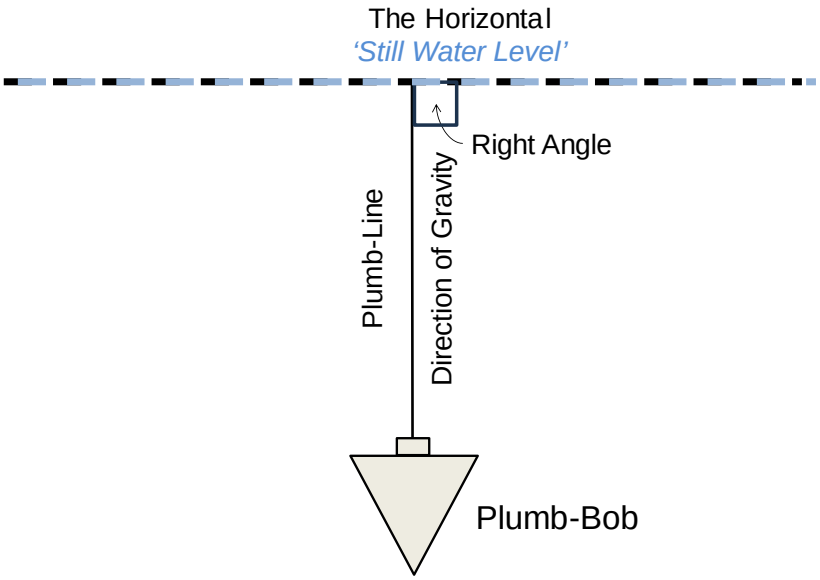


Figure 9: *Defining The Horizontal*.
Plumb-line at right-angle to the Horizontal,
'*Still Water Level*'

Source: Terry Ryan, 2011

Consensus of opinion with the Plimpton 322 tablet concluded, "*it was not solely about contemporary plane trigonometry rather, understanding the right-angle and relationship with a plumb-line (direction of gravity) and horizontal distance measurement.*" [16]

In summary,

> *The Plimpton tablet confirmed linear measurements were recorded with right-angle triangles and use of*

[15] MANSFIELD, D. F. 2020. "*A Study of Rectangles.*"
[16] MANSFIELD, D. F. 2020. "*A Study of Rectangles.*"

plumb-lines at right-angle to what is now known as the horizontal. Based on these mathematical principles, the tablet provided the fundamental rational that supported the future development of plane trigonometry.

Neolithic people's beliefs were tightly bound to nature, particularly rivers regarded as the *birth-place* of life and source of knowledge. Beliefs were tired to empirical observations of water-flow providing a profound connection with the Tigris and Euphrates Rivers. River flows were recorded during normal/high flows, droughts and floods. Slow river flows and water storage with dams were early examples of horizontal *still-water levels.* The rate of water-flow depends on river levels, gradient of river-bed, height of river banks and up-stream catchments. Although, not known as *gradient ratios*, empirical observations led to ideal laminar water-flows and optimum gradients for gravity-fed water structures such as canals, sluices, irrigation and fish-traps.[17] (Figure 10)

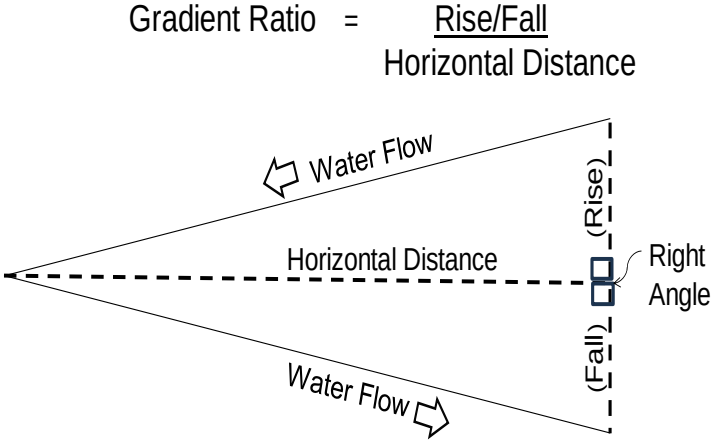


Figure 10: Water Flow Gradient Ratio, Right-angle Triangles.

Source: Terry Ryan, 2026

[17] PASCOE, Bruce. 2014. *"Dark Emu, Black Seeds: Agriculture or Accident?"* Pp 49, 55-59

During the Neolithic period, various civilisations collapsed from massive migration, floods, invasions and famine. City-states were threatened by environmental, economic and social upheavals. In the city of Nippur, Southern Iraq, the extent of damage was recorded on a map tablet. The Nippur tablet is a scribed rendition of the ancient city of Nippur, estimated to be a 4,400 years-old record of cadastral and topographical features during 2,300-2,100$_{BCE}$. It is thought, climatic chaos led to the demise of old parts of Mesopotamia, Egypt, Anatolia, Mediterranean and Levant settlements. Driven by survival necessities and recovery led to the Nippur Map tablet. It featured irrigation networks, ditches and canals shown by lines and surrounding towns recording damage and restoration work after long periods of droughts and floods. (Figure 11)



Figure 11: Nippur Map Tablet (Ni 125010)
Irrigation network of ditches, canals, towns.

Source: Istanbul Archaeological Museum

Cuneiform annotation described the *chaos* and damage for each parcel of land located near the centre of the city. The damage was believed to be caused by local gods and mythological creatures fighting in *never-lands* (*Sumerian Myth).*

Importance of Place

How do we know we belong to a place;
is it created by people, beliefs or myths?

Belonging is a universal human need, especially to a place. Belonging to a home is nourished in a way that reflects a way of life, an ancient delicacy connecting humanity through *body mind and spirit...* a sense of identity, wholeness and unity.

The Neolithic landscape of Mesopotamia was a myriad of tributaries, canals, irrigations and marshes. A place of entangled concepts, beliefs and intangible qualities made possible by a *hierarchy of relational deities* as custodians of sacred places, topographical features, divine knowledge and social settings.

The concept of deities and deep relationship with nature is typical of Neolithic people. Contemporary indigenous Australians continue to identify with *nature, culture and country* since arrival in Australia, some 65,000 years ago.

> *We belong to the land; it creates wholeness and purpose.*[1]

It is this peculiar experience of belonging, that finds its earliest and profound expression with indigenous Australians. A sense of belonging as part of the land.[2] In this sense, ownership or investment of effort does not provide the same sense of belonging. Early Australian history recorded the *delicacy of belonging* that can easily disrupt people and fragile land. (Figure 12)

[1] BURNAM, Burnam. 3 March 1988. Lecture.
[2] MALOUF, David. 2014. *"A First Place."*



Figure 12:
NSW First Land Claim,
Goanna Headland (Evans Head)
Chinamen's Beach, 1987

Source: Terry Ryan

Prehistory described Neolithic Period as primitive. 1960s archaeological artefacts repudiated that assertion. In addition, claims of prejudice, social values and lack of tangible evidence clouded prehistory interpretations written during 1800-1900s.[3]

The 1788 English colonisation involved prejudicial social values that blurred early history of indigenous Australians. English social class distinctions, exploitation of world-wide *slavery* influenced colonial government and social values towards people categorised as lesser humans. Colonisation of Australia introduced detrimental mind-sets of racial discrimination evident from historical interpretations of Indigenous Australians. [4, 5]

> *"Our biggest prejudice was failure to understand European culture was not the only way of life in Australia."* [6]

[3] CALDWELL, Wallace Everett. 1962. *"The Ancient World."*
[4] CALDWELL, Wallace Everett. 1962. *"The Ancient World."* Patrician the nobility derived from *patres* (father); Plebeians or Plebs, meaning filling or mass of people.
[5] PETTIGREW, William A. 2026. *"Britain's Slave Traders – A Forgotten History"*.
[6] CLARK, Manning. 1976. *"A Discovery of Australia."* 1976 Boyer Lectures.

The history-changing 1960s archeological artefacts, redefined the Neolithic Period. Newfound artefacts of clay tablets recorded evidence of innovation, invention and sophisticated abstract concepts. [7, 8]

Enlightened democratic civilisations have opposed human inequality and validation of people as upper or lower social class. It has been claimed, classification of people as lesser humans contributed to moral enslavement of people, until slavery was abolishment in 1833.[9] However, global decolonisation processes revealed government policies continued to support slave ownership during the colonisation of the *British Empire* until late 1800s.[10] The revelation claimed slave ownership was supported by social classes and archaic religious dogma.[11]

Global enlightenment towards slavery influenced changes in social attitudes and human rights rather than segregation and discrimination as measures of human value.

> *Segregation* for some, regarded as a form of apartheid. Actions creating circumstances for certain people should be apart from others due to perceived difference.
>
> *Discrimination* being distinguished from other people by relegation, rejection or segregation. Discrimination is a form of devaluation ranging from passive indifference to hostile personal abuse.
>
> *Racial* discrimination presupposes a superiority complex[i] based on ethnic, cultural or political pragmatism.

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[7] Archaeological Artefacts: 1969, Plimpton 322 Tablet c.1,900-1600$_{BCE}$. Nippur Map Tablet c. 2,300-2,100$_{BCE}$.
[8] TAYLOR, Vanessa. 2025.
[9] Slavery in the British Empire abolished in 1833.
[10] PETTIGREW, William A. 2026.*"13,000 individuals financed trafficking of 3 million enslaved Africans between 1563 until abolition of trade in 1803"*
[11] LAIDLAW Zoe, LYDON Jane. 2026. *"Legacies of British Slavery in Australia and New Zealand."* Manchester University Press. UK.

A sense of belonging to a place was an integral part of Neolithic spiritual practices involving sacred sites, ceremonies, mythical creatures, beliefs, warfare and massacres.[ii] [iii] [iv] Belonging to the land as a concept was not accepted by European Australia. However, tragic events at certain places have been treated as places of homage creating a sense of belonging to time, place or people for both Aboriginal and European Australia.[12]

Providing homage, described as a *transcendental provocation creating a sense of belonging* to a place, time or people is comparable to Indigenous Australian beliefs who also venerate country, culture and people. *[13]* However, European Australia has focused largely on differences between Aboriginal and non-Aboriginal Australia. One interpretation claimed social values led to unresolved paradoxes.[14]

Aboriginal Australia believe human spirit is recharged through connection with country, which was widely questioned by non-Aboriginal Australia. The difference resulted in paradoxical beliefs justified by European social values, political pragmatism and historical past. Failure to settle differences between Aboriginal and Non-Aboriginal Australia will prolong reconciliation with the colonisation of Australia and its ancient cultures.[15]

Cultures and values imported from other places interpreting local places and cultures is flawed. Imported cultures and values create an unrelated sense of place that negates interpretation of the place visited.[16] In the past, interpretations of histories were perceived through unrelated judgements rather than objective evaluation of local cultures, people or values. Perspectives from

[12] Returned Soldiers Settlement Act, 1916, administered through the NSW Crown Lands Consolidation Act
[13] RYAN, Terry. 1988. *"Keepers of the Great Southern Consciousness"*.
[14]CLARKE, Manning. 1976. "*Boyer Lecture*" Sydney, Australia
[15] BURNAM, Burnam. 3 March 1988. Lecture.
[16] RYAN, Terrence. 1988. *"Keepers of the Great Southern Consciousness."*

another place have clouded objectivity introducing biased discrimination, understanding and social discernments unrelated to cultures, people or values.

> *"Clearly it is not possible to judge a place from the outside looking in and believe there can only be one viewpoint."*

The *spirit of place* has gradually seeped into the Australian psyche. In the past, European perspectives tended to depreciate Indigenous Australia as primitive, unfit for civilisation and nature *hostile, brutish, barren, sterile and unsuitable for civilised people*.[17] However, for Aboriginal Australia, *it was the land of plenty.*[18]

Prehistory writings seem to reflect European exploration and discovery narratives of Australia during 1800s. Explorers sought *to be commended and rewarded with status, fame and fortune.* The prehistory writings from that time lacked archaeological evidence of primitive settings and crude struggles in hostile surroundings were subjective interpretations. Prehistory interpretations are similar to the 1800s explorers' accounts who struggled in harsh places not knowing the land. However, it is thought explorers and writers overly dramatized the Australian setting as an *untamed hostile place.* In hindsight, early European exploration of Australia has been regarded as a *pursuit of personal honours, fame, fortune and heroic story-lines.*[19, 20]

> *Historians and explorers misjudged indigenous people and misinterpreted the Australian landscape.*

[17] FAVENC, Ernest. 1888. *"The History of Australian Exploration – From 1788-1888."*
[18] BURNAM, Burnam. 1988. Lecture
[19] HALLMAN, Frank, M. 1973. *"Legal Aspects of Boundary Surveying as apply in New South Wales."* P 211.
[20] KASS, Terry. 2008. *"Sails to Satellites - The Surveyors General of NSW (1786-2007)." 1839, Thomas Mitchell pursued knighthood*… P 90.

Acceptance of the Australian setting has raised awareness of a fragile landscape and spiritual connection of Aboriginal places to the universe, *rather than grains of sand lost in the vastness of Australia*.[21]

In 1975, Australian consciousness was strengthened by the acknowledgement of Aboriginal Australia after 200 years of English colonisation. The occasion marked the first step towards reconciliation between Aboriginal and Non-Aboriginal Australia before the 1992 landmark Mabo case.[22] The symbolic gesture of soil running through the hand of the Australian Prime Minister, Hon., Gough Whitlam into the hand of Mr. Vincent Lingiari highlighted the sincerity felt by most Australians, particularly, Gurindji People (Figure 13)



Figure 13: Aboriginal Land Rights, 1975
Vincent Lingiari (Gurindji People), Gough Whitlam (Prime Minister of Australia)
Watty Creek, Northen Territory, Australia.
Source: Internet

[21] BURNAM, Burnam. 1988. Lecture: "*the energies of this continent are more powerful than all the people who ever lived here*" and "*spiritual centres around Australia are linked to form divine force*".
[22] Mabo v Queensland case, known as Mabo, was a landmark High Court of Australia decision (1992) that recognised native land title for the first time, rejecting the *terra nullius* doctrine in favour of the common law doctrine of aboriginal title.

The Aboriginal culture is bound to the spirit of the land. A trait shared with the Mesopotamian Neolithic people whose beliefs also include mythical deities, divine sacredness, origins of life, spiritual water and places of rituals, deep relationship with nature, divine entities (*rivers, mountains, trees*), rituals, and social values.[23, 24] Aboriginal Australia has continued with social values from dreaming, law, social structure, kinship, totemism, spirituality and economy.[25] (Figure 14)

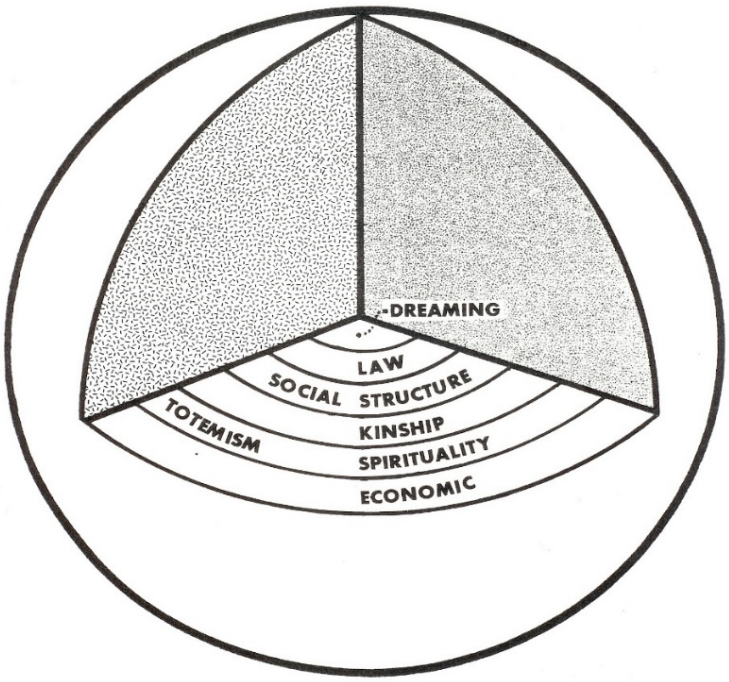


Figure 14: Aboriginal Australia - Social Values

Source: RYAN, Terrence. 1988

Aboriginal Australia and Mesopotamian Neolithic People share social values reflecting necessities of life (*food, water, shelter),* nature, deities, origins of life, mythology, ancestral beings, sacred places, ceremony, oral/written history and spiritual encounters with nature. [26, 27]

[23] PERDIBON, Anna. 2021. "*Between The Mouth Of The Two Rivers.*"
[24] RYAN, Terry. 1988. *"Keepers of the Great Southern Consciousness"*.
[25] CAMPBELL-BUCK, Margaret. 1 March 1988. Lecture: Aboriginal Australia. Sydney, Australia.
[26] CAMPBELL-BUCK, Margaret. 1 March 1988. Lecture: Aboriginal Australia.
[27] RYAN, Terrence, EDWARDS, P.R. 1985. *"Goanna Headland: A Balance between Culture, Natural Resources and Community Values"*.

End Notes

[i] MEHTA, Suketu. 2014. *"The Superiority Complex."* Time, Volume 183, Number 4, 2014.

> *"The language of racism in America has changed, though the plot remains the same. It is not about skin colour anymore – it's about cultural traits. And it comes cloaked in a whole lot of social-science babble.*
>
> *The new racialists are too smart to denigrate particular cultures. Instead, they come at things the other way. They praise certain cultures, hold them up as exemplary. The implication – sometimes overt, sometimes only winked at – is that other cultures are inferior and this accounts for their inability to succeed."*

[ii] GINIBI, Ruby Langford. 1994. *"My Bundjalung People."* University of Queensland Press. Queensland, Australia.

> *"There's a story spoken tradition among Bundjalung people about the massacre which still survives today amongst Aborigines living in the Box Ridge community.*

[iii] GINIBI, Ruby Langford. 2007. *"All my Mob.",* page 237. University of Queensland Press. Queensland, Australia.

> *"My mob called it Weeping Island, because it was where the big massacre of my people was in 1842"*

[iv] KOORI MAIL. 1993. *"The Evans Head Massacre."* 10 March 1993. 46th Edition.

> *"The frontier of white settlement moved north to the Richmond River in the early 1840s.*

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Author's Notes

The Neolithic period introduced large-scale agricultural communities, improved food and water security enabling larger populations to grow and prosper. Settlements became city-states grown from collective knowledge and common social values. It seems, Neolithic people had mathematical skills before development of agricultural settlements. The notion of number and magnitude depend on common language patterns, such as, one, two or three, as well as geometrical skills with measurement, areas and volumes. It is thought, mathematics first occurred during the late *Stone Age Period* when humans reasoned with gestures for basic needs, however, the origin of number-words isn't known. The move from making gestures about quantities of physical things to number symbols or words probably occurred with counting or measurement. Numbers were needed for agricultural produce, lengths, areas and volumes. Distance measurement relied on consistent units of standard lengths, such as the *Nippur or Egyptian cubit*.[1] Measurement tools relied on repeatability of length, use of *plumblines*[2] with horizontal distance measurement and gradients for gravity-fed water distribution, supply and irrigation systems. It is thought, the concept of numbers was further developed with accounting practices (*transactions, records of quantities, type of product or service*). The cuneiform numerical characters described two variables: quantity and symbols representing item/s being sold or purchased; it was a basic accounting record of numbers and items that led to the invention of writing.[3]

Prehistory Sumerian farmers developed an early form of differential equations predicting outcomes for cattle breeding, meat and dairy production. Predictions were calculated over yearly periods for increase in cows, number of calves, production

[1] Figure 11: Nippur Map Tablet; Irrigation network of ditches, canals, towns.
[2] Plumbline: At right angles (90^0); a plumb-bob is a (lead) weight suspended by string line defining the vertical or plumb line in relation to gravity.
[3] Figure 5: Cuneiform Accounting Tablet

of dairy oil and cheese.[4] In $3{,}300_{BCE}$, a hollow clay sphere contained tokens representing quantities of grain for feeding live-stock (*grain per live-stock*) represented by algebraic values.

It is thought, mathematical procedures were something you did as a ritual not requiring justification, only duplicating an established procedure. For example: Ancient Egyptians were governed by the Ma'at concept of divine truth, order or justice, personified as a Goddess of natural, state and individual worlds. Ma'at principles applied to consistent order (*sequence*) and procedures were strictly followed.

Neolithic civilisations developed survival strategies focussed on *Surplus, Trade and Time,* all linked to agriculture, patterns of weather and periods/times tracked by celestial bodies (*Sun, Moon, Stars*) in relation to seasons (*planting, harvesting*). Time was associated with physical evidence and predictions (*divine prophecies*). Mass-agriculture developed from greater understanding of crop cycles and refined measurement of time by tracking celestial bodies against backdrop of stars as well as recording weather patterns. Measurement of time improved with greater precision of observations using vertical stones to mark the geographical location of risings and settings of the sun/moon defining seasonal cycles. *(Example: Neolithic stone henges).*

What triggered changes during the Neolithic Period?

Changes during the Neolithic period were influenced by previous mass migrations when Homo Sapiens first migrated into Asia, Europe and Australia and eventually, Americas.[5] It is thought, triggers for mass-migrations included extreme natural disasters: droughts, floods, earthquakes and volcanic eruptions. Changes during this period were the result of severe natural disasters (c.$1{,}200\text{-}1{,}150_{BCE}$) during the Bronze Age. Survival from these

[4] HEATON, Luke. 2015. *"Mathematical Thought"*. Pp 30-34.
[5] GROCUTT, Huw, S. 2026. *"Revolution, modernity and the dispersal Homo Sapiens beyond Africa."*

disasters prompted early development of human skills, greater understanding of causal factors and resilient community settlement involving food security (*fertile soil, water*). Neolithic people adapted to changes with developing agricultural skills (*water storage, distribution, irrigation, cropping*) and rearing of domesticated animals for food sources.[6] The Neolithic people transited from relatively small groups of hunter-gatherers for over 300,000 years into agricultural producers.

In hindsight, early settlements faced inevitable changes that created new life perspectives, particularly, water as a life source.[7] The prehistory period has been scantily addressed, almost treated as an incidental period lacking archaeological evidence and historians' underestimating humanities' resilience with surviving extreme challenges (*mass migration, scarcity of food, water, warfare…*) and human evolution influenced by *fight or flight,*[8] *learnt fear*[9] and necessities of life (*hunger, thirst, pain*) foundations of greater consciousness.[10]

The Neolithic Period was distorted by extreme life-threatening events producing two options; *perish or change*:

> *Perish*; maintaining *status quo;* reliance on spiritual beliefs (*divinity, nature*) and finite community resources (*food, water, shelter*).
>
> *Change*; Migration, avoid natural disasters, food/water security, warfare, unknown resources, new perspectives, social values, mass-agriculture, innovation and human development.[11]

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[6] CALDWELL, Wallace Everett. 1962. *"The Ancient World"*. P 12.
[7] PERDIBON, Anna. 2021. "*Between the Mouth of The Two Rivers.*"
[8] GROSS, Richard. 2010. *"Psychology, The Science of Mind and Behaviour."* P 188.
[9] KANDEL, Eric, R. 2006. *"In Search of Memory - The emergence of a new science of mind."* P 339. *'Brain fear responses: defensive behaviour, arousal, reflex, stress.'*
[10] DAMASIO, Antonio. 2026. *"Natural Intelligence and the Logic of Consciousness."*
[11] RYAN, Terry. 1988. *"Keepers of the Great Southern Consciousness"*.

References

CALDWELL, Wallace Everett. 1962. *"The Ancient World"*. Holt, Rhinehart and Winston, New York, USA.

DAMASIO, Antonio. 2026. *"Natural Intelligence and the Logic of Consciousness."* Pantheon, US/UK.

FARRINGTON, Benjamin. 1969. *"Greek Science"*. Penguin Books, Middlesex, England.

FAVENC, Ernest. 1888. *"The History of Australian Exploration – From 1788-1888."* Turner and Henderson. Sydney, Australia.

GROCUTT, Huw, S. 2026. *"Revolution, modernity and the dispersal Homo Sapiens beyond Africa." Quaternary Science Reviews."* The International Journal of Earth, Climate and Life Interactions.

HALLMAN, Frank, M. 1973. *"Legal Aspects of Boundary Surveying as apply in New South Wales."* The Institution of Surveyors, Australia. NSW Division. Sydney, Australia.

HEATON, Luke. 2015. *"Mathematical Thought"*. Robinson, UK.

KANDEL, Eric, R. 2006. *"In Search of Memory - The emergence of a new science of mind."* W. W Norton & Company, New York, USA, UK.

KASS, Terry. 2008. *"Sails to Satellites - The Surveyors General of NSW (1786-2007)."* NSW Department of Lands. Bathurst, Australia.

KITTO, H.D.F. 1951. *"The Greeks"*. Penguin Books, Middlesex, UK.

LAIDLAW Zoe, LYDON Jane. 2026. *"Legacies of British Slavery in Australia and New Zealand."* Manchester University Press (ISBN: 978-1-5261-8481-8). UK.

MANSFIELD, D. F. 2020. "*A Study of Rectangles."* Foundations of Science. UNSW, Sydney.

PASCOE, Bruce. 2014. *"Dark Emu, Black Seeds: Agriculture or Accident?"* Griffin Press, South Australia.

PETTIGREW, William A. 2026. *"Britain's Slave Traders – A Forgotten History"*. Kings College. London, UK.

PERDIBON, Anna. 2021. "*Between The Mouth Of The Two Rivers.*" Etnološka Tribina 44, Vol. 51. Center for Ancient Mediterranean and Near Eastern Studies (CAMNES), Florence.

RYAN, Terrence, EDWARDS, P.R. 1985. *"Goanna Headland: A Balance between Culture, Natural Resources and Community Values"*. NSW Staff Surveyors Association. Sydney, Australia.

RYAN, Terry. 1988. *"Keepers of the Great Southern Consciousness"*. NSW Anthroposophical Society, Sydney, NSW, Australia.

RYAN, Terry. 2021. *"Circles, Circles Everywhere – Wheels, Geometry, Formulae."* Monograph.

STEINER, Rudolf. 1977. "*World History in the Light of Anthroposophy.*" The Camelot Press Ltd, Southampton, UK.

TAYLOR, Vanessa. 2025. *"Between the Mouth of Two Rivers".* Center for Ancient Mediterranean and Near Eastern Studies (CAMNES). Florence, Italy.

THOMAS, Warren. 2024 *"Henry, Me and Philosophy."* Azimuth No 62 Issue 4, P8. The Institution of Surveyors NSW, Sydney, Australia.

About the Author

Terry's diverse surveying career has included: cadastral, construction, mineral extraction, design of Lynne Park (Rose Bay), construction surveys for Sydney Farm Produce Markets (Homebush) and boundary surveys for Sydney Harbour National Park. During 1970s, he was involved with geospatial information technologies, programmable calculators, electronic distance meters, surveying practices and policies.

Terry's interest with spatial information developed from trialling applications of three-dimensional information, show casing potential practises and scalable concepts for state-wide *spatial information systems.*

In 1982, Terry was appointed by Lord Howe Island (LHI) Board, supported by the Hon., Neville Wran, Premier of NSW, to direct *"whole of government"* approach for a Regional Environmental Plan (REP) for Lord Howe Island in accordance with UNESCO's *Protection of World Cultural and Natural Heritage Convention* and *Environmental Planning and Assessment Act, 1979* to replace LHI Land Management Scheme. A Regional Environmental Study (RES) involved study specialists from private and state government bodies.[1] The RES attracted national attention with the use of spatial information, digitisation of analogue plans, studies, maps/plans, aerial photography and LANDSAT satellite imagery. The published RES was produced from correlated geospatial information for RES (Vol 1) and Map Atlas (Vol 2) used for policy formulation in the Regional Environmental Plan (REP) as well as satisfying World Heritage Listing of the Island.[2] The REP was published by the LHI Board in 1985.

[1] RES Participants: Dept, Environment/Planning, Soil Conservation Service, Howard Tanner and Assoc., Pannell Kerr Forster Serv., Dept, Agriculture (Fisheries), Crown Lands Office.

[2] RYAN, Terry, De MARCO, Christine. 1985.*"Lord Howe Island Regional Environmental Study"*. Volumes 1 and 2. Lord Howe Island Board. Lord Howe Island, NSW, Australia.

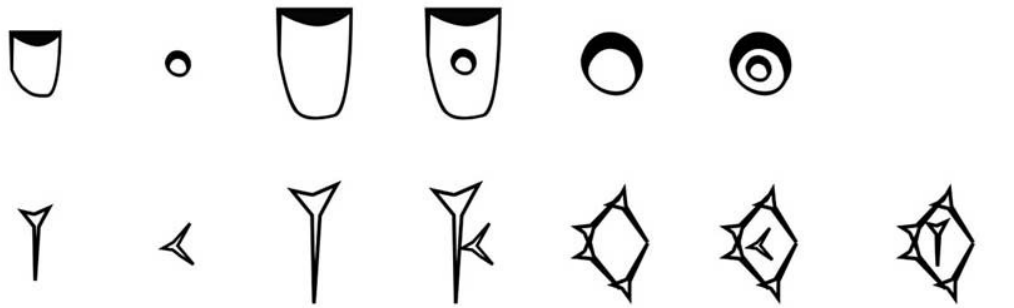
Terry's involvement with spatial information technologies continued with NSW's first aboriginal land claim at Goanna Headland, Evans Head, NSW [3, 4] and later, Sydney Water's Installed Facility Information System (IFIS) covering Sydney, Blue Mountains and Wollongong.[5] As a Consultant, he worked with OMNILINK Consulting Services,[6] producing strategic geospatial information technology plans for Regional Victorian Councils and Far North Queensland.[7]

Terry was a founding Director, Chairman, Executive Director and Life Member of Geospatial Information and Technology Association (GITA), Australia and New Zealand. Under his leadership, GITA provided learning, networking, conferences, workshops and forums for utility industries in Australia, New Zealand and developing countries.

Terry taught surveying at Sydney Institute of Technical and Further Education (TAFE), University of Technology Sydney and The University of NSW. He was a long-term member of a visiting committee at The University of NSW (UNSW), School of Surveying and Spatial Information Systems: reviewing course curriculum, scholarships and industry liaison. In 2001, He was awarded an Emeritus Certificate by the NSW Board of Surveyors for services to surveying Industry.

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[3] RYAN, Terrence, EDWARDS, P.R. 1985. *"Goanna Headland: A Balance between Culture, Natural Resources and Community Values"*. NSW Staff Surveyors Association Conference. Sydney, Australia.
[4] DEPARTMENT OF LANDS (NSW). 1987. *"Draft Plan of Management, Goanna Headland."* Evans Head, NSW, Australia.
[5] IFIS contained: 1.4 million properties, 21,000 km water, 21,000 km sewer and 500 km stormwater facilities.
[6] OMNILINK Consulting Services; location centric technology and data management services including property and asset information.
[7] Regional Victoria: Ballarat City, Golden Plains Shire, Hepburn Shire and Moorabool Shire Council. Far North Queensland: Douglas Shire Council


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