

The Neolithic Cognitive Leap:

More Than a Revolution the New Stone Age Involved a New Understanding of Time

By Rick Doble



Model of a Neolithic village. City Museum: Wels (Upper Austria).
https://commons.wikimedia.org/wiki/File:SMWM_-_Jungsteinzeitliches_Dorf_1.jpg

Copyright © 2022 Rick Doble



Licensed under the
Creative Commons Attribution-NonCommercial 4.0 International Public License

You can view other papers by Rick Doble about art and time at:

<https://unc.academia.edu/RickDoble>

This article is from my blog DeconstructingTime

View Rick Doble's blog *DeconstructingTime* at:

<http://deconstructingtime.blogspot.com>

***All images & photographs are from
commons.wikimedia.org
unless otherwise credited***

ABSTRACT:

While all agree that the Neolithic era was a revolution, the change was even more monumental. While I believe Upper Paleolithic people could work with and plan short-term projects and processes, their way of life was generally one of immediacy. They did not store and save food for times of scarcity, for example. But in the Neolithic era, an understanding of long-term linear time allowed the societies to radically change their way of life by planning their farming over a year's time and then developing a large number of processes that required long-term conceptions. And it was this ability that allowed the Neolithic cultures to flourish.

INTRODUCTION

Imagine that after climbing a hill the member of a small nomadic hunter-gatherer tribe looked down on a Neolithic village for the first time. They would have seen hundreds of people wearing woven cloth garments who lived in one place with solid houses surrounded by carefully cultivated fields of grain. Because it was so strange, so fantastic, he or she might have thought it was a dream or mirage or believed it was from another world.

In our modern world, we need to recapture this sense of awe. Because the Neolithic (New Stone Age) way of life was dramatically different from the earlier Paleolithic (Old Stone Age) nomadic hunter-gatherer lifestyle. While it used stone-age implements, it was a completely different way of living with its own unique technology. Instead of looking at the Neolithic era from a modern point of view that sees it as crude and primitive, we need to look at it from the POV of earlier humans who had lived successfully for millions of years as nomads and who lived in small bands as they foraged for food. They must have been astonished to see this very different way to live and survive.

In other words, to understand the Neolithic we need to put ourselves back into their time period and see it from that point of view.

The problem, oddly, is that the Neolithic way of life is, in a way, familiar. It is like life in small villages that we know today. Yet because of its stone-age technology, this way of life is seen as backward. But we are the ones who have it backward. Small villages are based on Neolithic villages because they were invented by these cultures.



Model of a Neolithic village. City Museum: Wels (Upper Austria).
https://commons.wikimedia.org/wiki/File:SMWM_-_Jungsteinzeitliches_Dorf_2.jpg

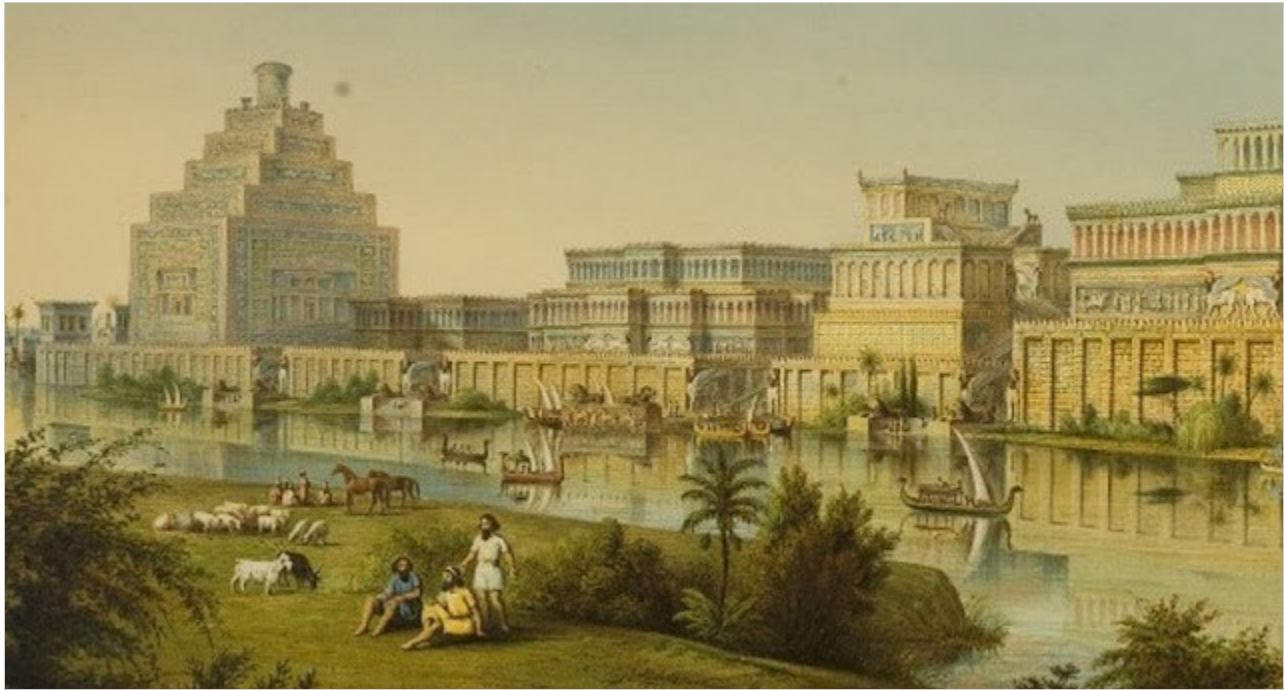
It is my contention that the modern age begins with the Neolithic era. For example, until about a hundred years ago and the impact of the industrial revolution, small farming villages were the norm for most nations around the world. In 1900 in the United States, for example, 40% of people farmed and 60% lived in rural areas. (Lusk, The Evolution of American Agriculture)

The great first civilizations of Mesopotamia and Egypt took the Neolithic model and made it much bigger, more sophisticated, and complex but it was dependent on a sedentary lifestyle supported by agriculture, domesticated animals, trade, and specialization that had been established in the Neolithic era.

Even the invention of metal technologies owed their origins to Neolithic skills. The Bronze Age, seen as a clear break from the 'primitive' stone age, depended on Neolithic inventions. Neolithic pottery kilns were able to achieve high temperatures which had not been possible before. And this ability led directly to the even higher temperatures necessary for metallurgy. Furthermore, the use of New Stone Age tools continued for thousands of years after the invention of bronze because they worked well, were easy to make, and were inexpensive (see more in this article).

"From the standpoint of tools, the potter's kiln and art were necessary steps to metals, for a modification of the kiln probably provided the high temperatures ..."

<https://www.britannica.com/technology/hand-tool/Neolithic-tools>



A fanciful depiction of early civilized life in the Assyrian city of Nimrud ca. 1350 BCE.
From *Myths and Legends of Babylonia & Assyria* by Lewis Spence, 1910.
https://commons.wikimedia.org/wiki/File:The_Palaces_at_Nimrud_Restored.jpeg

THE NEOLITHIC GIANT LEAP

For two to three million years, hominins had lived as nomadic hunter-gatherers in small bands of 100 at most. (Birch-Chapman et al., Estimating population size, density and dynamics of Pre-Pottery Neolithic villages...)

We also know from contemporary hunter-gatherers that when food was found it was eaten immediately and saving food for times of scarcity did not happen.

"Hunter-gatherers have little or no stored food, and no concentrated food sources, like an orchard or a herd of cows: they live off the wild plants and animals they obtain each day." (Diamond, *The Worst Mistake...*)

But in a relatively short period of time -- about ten to twenty thousand years -- some nomadic hunter-gatherers adopted a sedentary way of life where they lived in villages with many hundreds of people and grew crops. And this was revolutionary. But as I continued to study, I realized that it was much more. It was a giant cognitive leap, it was a major breakthrough in human understanding.

While there are many aspects to this cognitive leap, I would suggest the principal one was a new understanding of time.

Life as hunter-gatherers was immediate and of the moment. Life as Neolithic farmers was quite different. It required an understanding of the yearly cycle of seasons and also how to plant, grow, harvest, process, and store grains at just the right times and in the right way which involved planning and preparation.

However, I believe these Neolithic cultures also saw 'big time' or cosmological time as cyclical. Sunrise to sunset, the phases of the moon, winter, spring, summer, fall, birth, and death were all cyclical. But within those cycles humans could work with linear time.

For Neolithic people, there were plenty of examples of linear time within cyclical time. The seasons occurred in the same order every year. In early spring seeds were planted which then sprouted and grew through the summer and then were harvested in the fall. Agriculture was a process that had to be done in sequence. This was both a linear progression and also a cycle that repeated itself year after year. Preparing the soil, planting and harvesting had to be done in the correct order and at the right times to ensure a bountiful harvest.

Once Neolithic cultures grasped how linear time functioned within cyclical time, it opened the door to an understanding of processes in general which created a wide variety of new tools and products and also gave people a new control over the environment.

Neolithic time marked the beginning of our modern concept of time, of long-term linear time, time that is conceptualized as something that can be controlled. Time could now be planned or managed or used as a resource. Time did not just flow uncontrollably, it could be harnessed and used to human advantage.

NEOLITHIC TIME CONCEPTS

We do not know any Neolithic languages because writing had not been invented. Nevertheless, we can infer a significant amount of information about the Neolithic ability to work with time from their technology.

We know, for example, that with agriculture they wisely focused on grain crops, which they learned how to harvest and then place in long-term storage which became insurance against droughts and famines. But that was just the start. They learned to domesticate these crops so that their yield increased substantially. In addition, they chose crops whose seeds remained on the stems -- which was a mutation but which was useful because it made harvesting much easier; it was an aberration that humans wisely took advantage of because normally plants allowed seeds to blow and scatter so they could grow in the wild.

"Domestication is the process by which farmers select for desirable traits by breeding successive generations of a plant or animal. Over time, a domestic species becomes different from its wild relative.

"Neolithic farmers selected for crops that harvested easily. Wild wheat, for instance, falls to the ground and shatters when it is ripe. Early humans bred for wheat that stayed on the stem for easier harvesting." (History.com, Neolithic Revolution: Plant domestication)

From the above and other technological innovations (more next), we can surmise that Neolithic cultures had a complete toolbox of shared linear time concepts that allowed them to plan, coordinate and work together for short-term, medium-term, and long-term goals. And judging from all other languages, many of these concepts were probably expressed in words.

"Time reference is a universal property of language..."

Jacqueline Lecarme, Ph.D., Linguistics
(Lecarme, Nominal Tense and Tense Theory)

These concepts would also have made it possible for them to develop and refine processes. Processes such as making cloth from flax or pottery from clay required a number of specific steps in sequence so an understanding of linear time was key.

I believe this understanding of processes had been developing for hundreds of thousands of years, but with the Neolithic era, there was a flowering of knowledge, understanding, skill, technology, and careful observation. Because it was at this point that technology reached a kind of critical mass in which very new things were possible. Some techniques or processes were so useful and so well thought out, that they are still used today or until recently. I describe some of these later in this article.

ABOUT ANIMAL TIME, PALEOLITHIC TIME, AND NEOLITHIC TIME

It is my contention that early humans, i.e., hominins, slowly emerged from their animal sense of immediate time to grasp a new sense of linear time that had a past, present, future, and duration. It may have taken millions of years but by the Upper Paleolithic, I believe Homo sapiens had a fully developed sense of linear time but still saw time as being primarily immediate. This could be called 'short-term' linear time. By this, I mean that Upper Paleolithic people could plan to make sophisticated bows and arrows with a variety of materials or plan a group hunt of migrating animals, but understanding linear time as it related to seasons or the yearly cycle was not part of their mindset.

There is one clear example of this in the time concepts of the nomadic hunter-gatherer Piraha tribe in the Amazon.



A Piraha community. The Pirahas are hunter-gatherers who live in the Amazon.
https://commons.wikimedia.org/wiki/File:Pirahas_of_Brazil.jpg

The Piraha tribe in the Amazon adheres to an Immediacy of Experience Principle according to linguist Dr. Daniel Everett. Their time frame and concepts are built around the moment. This is integral to their language but also to their culture and their technology. When he asked them what the Amazon jungle was like thousands of years ago, they said it had always been the way it is now -- not believing in any long-term past. The culture rejected any mention of time beyond the Piraha's accepted concepts and this was part of their technology -- as they were not interested in expanding their skills to include longer planning. (Colapinto, Has a remote Amazonian tribe upended our understanding...)

The Neolithic sense of time was quite different. Neolithic cultures understood long-term linear time within the context of yearly cyclical time. In other words, a long-term sense of time was essential to the Neolithic way of life because it was necessary for an understanding of the seasons and agriculture. This sense of time also played a part in their ability to work with and improve a variety of processes such as pottery, weaving, and tool-making that were time-consuming and required a number of steps in sequence.

The most dramatic and clear-cut example of the difference between a nomadic hunter-gatherer lifestyle and that of the Neolithic is shown in the way each group handled food. For the Piraha mentioned above, food is consumed immediately and there is no thought about planning.

The Piraha eat what they catch in the river and gather in the jungle and are quite good at doing this on a day-to-day basis. While they could preserve food for future use, Dr. Everett found they were not interested, even though there were days when they went hungry. (Colapinto, Has a remote Amazonian tribe upended our understanding...)

Neolithic societies, however, spent considerable thought and effort on creating storage systems so that they would have food for the long term. The following describes examples of storage designs.

"The granaries represent a critical evolutionary shift in the relationship between people and plant foods...The transition from economic systems based on collecting and foraging of wild food resources before this point to cultivation...[of] managed resources in the PPNA (Pre-Pottery Neolithic) illustrates a major intensification of human-plant relationships.

"People in the PPNA were the first in the world to develop systematic large-scale food storage.

"All of the granaries [ED: found in this study] were circular structures ~3 × 3 m on the outside and were built with suspended floors for air circulation and protection from rodents and insects." (Kuijt & Finlayson, Evidence for food storage and predomestication granaries 11,000 years ago...)

"In the... Neolithic periods, hermetic storage was used in the form of underground pits.

Found in the Middle East as well as in Europe, these pits were used to store dried food.

"Simply put, hermetic storage has a gas-tight and moisture-tight environment that kills off insects and inhibits mold growth." (GrainPro, A Brief History Of Hermetic Storage)

An Example Of A Long-Term Process

Weaving is a good example of a long-term process that began in the Neolithic era. First flax had to be carefully planted and harvested, next there were complicated procedures to extract fiber from the flax plant, then the fiber had to be spun into thread and finally woven on a Neolithic loom. The last step was to cut and sew the cloth to make a garment.

Click on the next link to see detailed descriptions of the 12 steps that are typically involved in the process of making linen from flax.

From Flax to Linen: <https://ulsterlinen.com/flax-to-linen/>

EVIDENCE FOR AN UNDERSTANDING OF YEARLY TIME

The Importance Of The Winter Solstice To Neolithic Societies

Today it is hard for us to understand the importance of knowing the time of the winter solstice when the solstice occurs. Having such knowledge allowed Neolithic people to be in touch with the precise cyclical nature of reality and also yearly time and the beginning of a new year.

But even when carefully observed, the math involved with a yearly repeating calendar was daunting, especially since a year is not an even number (roughly 365 1/4 days) and the moon phases do not stay in sync with the sun's yearly cycle. Thousands of years later classical societies, such as Rome, struggled with this problem for centuries causing the calendar to be off a large number of days. This continued until the Julian calendar was adopted.

Knowing the sequence for days and months was easily calculated using the phases of the moon. But the moon's cycles and the sun's yearly cycle did not match. So Neolithic societies needed to find a way to make sure that these cycles worked together.



Phases of the moon.

https://commons.wikimedia.org/wiki/File:Moon_phases_en.jpg

Each year the calendar had to be reset so that farmers knew the sequence of the moon's phases in relation to the sun's yearly cycle. Otherwise using only a lunar calendar could cause major miscalculations. In an agricultural society, this would be crucial.

Aubrey Burl & Clive Ruggles (two of the most respected authorities) agree that a "concern with the moon...is 'significant', (i.e. cannot be coincidental) is widespread and is a feature of Early Neolithic sites."

(Mercer, Background notes to Neolithic cosmology)

The Neolithic 'calendar' in general was the sun and the moon and the stars. Time was indicated by the change in these cycles. Understanding these cycles was crucial for understanding the passage of time.

So what the Neolithic people did was not only smart it was brilliant and a cognitive leap.

They realized that knowing when the winter solstice occurred would allow them to reset the year's calculations and bring their timekeeping into line. However, the winter solstice is very difficult to determine as the lengths of the days around the solstice only vary by a few seconds and the angle of

the sun on the horizon hardly varies at all. Moreover, the sun rises later each day after the solstice for about two weeks, which must have been confusing.

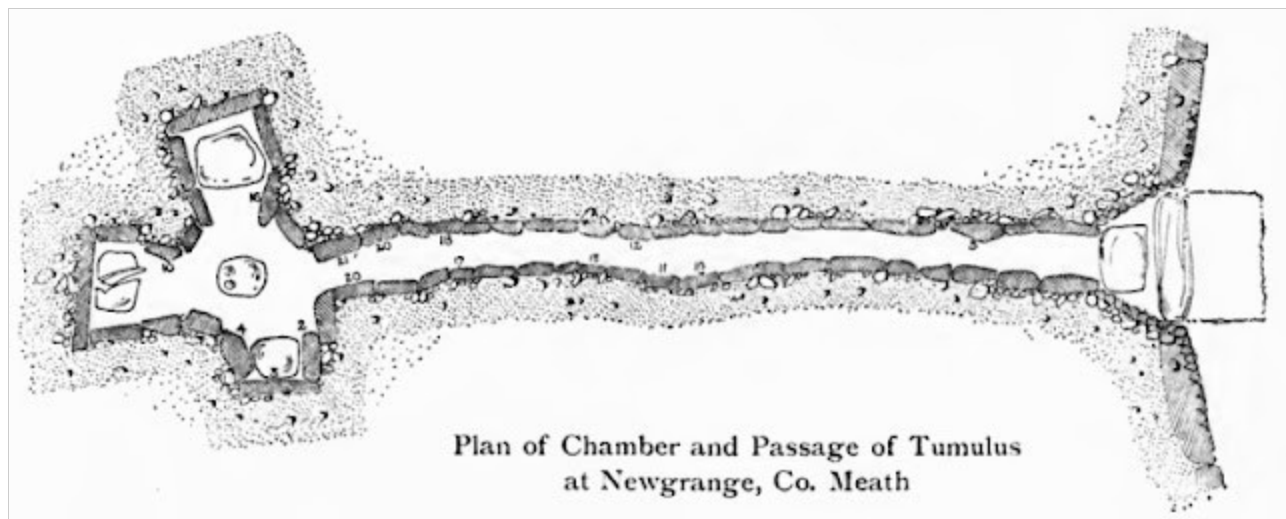
2021		Sunrise/Sunset		Daylength	
Dec		Sunrise	Sunset	Length	Diff.
18	▼	8:36 am ↘	4:06 pm ↗	7:30:32	-0:26
19	▼	8:37 am ↘	4:07 pm ↗	7:30:13	-0:18
20	▼	8:37 am ↘	4:07 pm ↗	7:30:01	-0:11
21	▼	8:38 am ↘	4:08 pm ↗	7:29:57	-0:04
22	▼	8:38 am ↘	4:08 pm ↗	7:29:59	+0:02
23	▼	8:39 am ↘	4:09 pm ↗	7:30:09	+0:09

Chart of December sunrise times and day lengths in Dublin Ireland in 2021 (close to Newgrange) around the time of the solstice.

This chart is derived from information at the following website:

<https://www.timeanddate.com/sun/ireland/dublin?month=12&year=2021>

The Neolithic societies had to create a way to determine the day of the solstice or the time period around the solstice. So many of them created a kind of 'instrument' that was sensitive to the angle of sunlight. When the time around the solstice occurred, the sun would light up a narrow opening.



The passageway at Newgrange allows sunlight to enter it only during the time of the solstice.

Coffey, George. Drawings of Newgrange from the late 1800s. Published in: The Dolmens of Ireland, by William Copeland Borlase. Published by the University of Michigan Library (January 1, 1897).

The passage tomb at Newgrange in Ireland is the most dramatic example of this capability because its passageway allows light to enter the monument only during 5 days around the time of the solstice and it may even be able to determine the day of the solstice in real-time, although this has not yet been confirmed.



LEFT: "A section of the passage leading towards the chamber of the Newgrange passage tomb in Ireland."

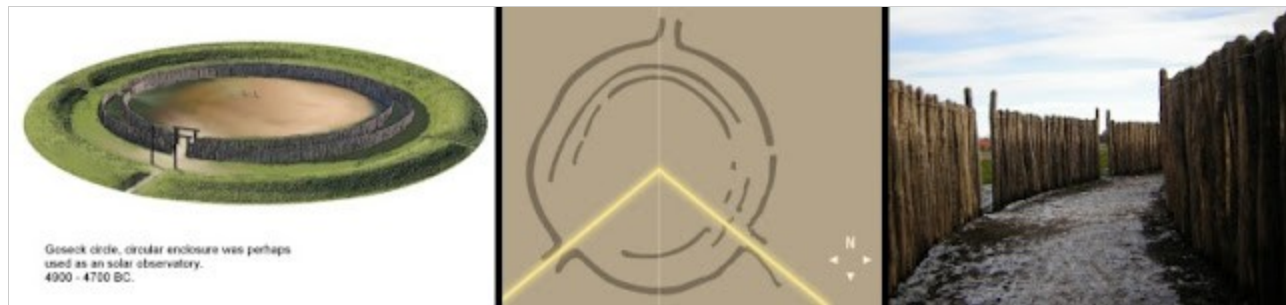
https://commons.wikimedia.org/wiki/File:Passage_leading_towards_chamber_of_Newgrange_passage_tomb_in_Ireland.jpg

RIGHT: The light of the solstice in the passageway in 2013.

https://commons.wikimedia.org/wiki/File:2013_Solstice_Newgrange.jpg

But it is now clear that generally speaking, this was a widely known Neolithic skill. For example, more than a hundred Neolithic 'circular enclosures' have been discovered in Northern Europe and many were designed to determine the time around the winter solstice. These have only just been discovered in the last thirty years from post-hole patterns.
(Neolithic Circular Enclosures in Europe)

For example, in 1991 the 'Goseck Circle' in Germany (4,900 BCE - 4,700 BCE) was discovered with aerial photography that revealed a pattern of post holes. It was a kind of wooden stone henge. The Goseck Circle had narrow openings that were aligned with the sunrise and sunset of the winter solstice.



LEFT: Goseck Circle.

https://commons.wikimedia.org/wiki/File:Goseck_circle,_Germany_4900_-_4700_BC.jpg

MIDDLE: A diagram showing how the solstice sunrise and sunset entered the openings in the Goseck circle.

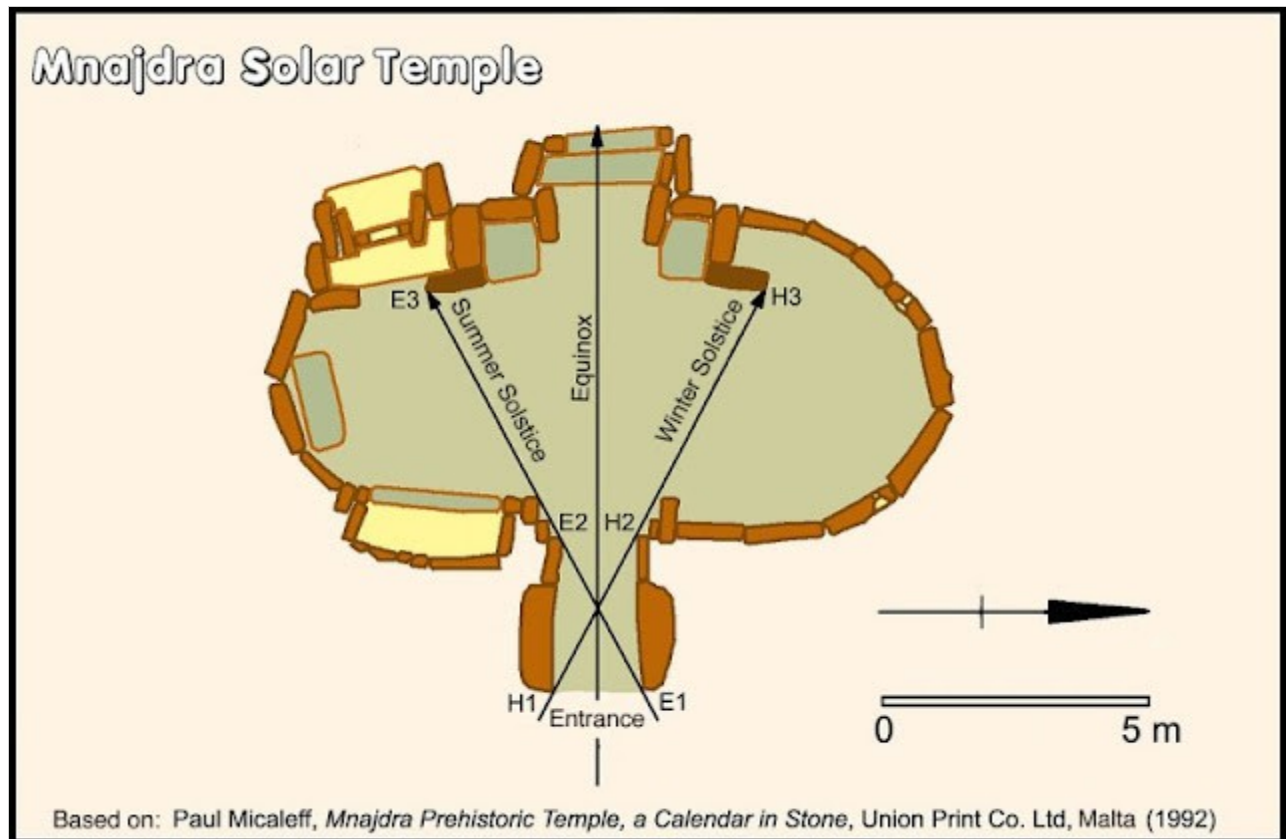
<https://commons.wikimedia.org/wiki/File:Goseck-2.jpg>

RIGHT: An interior shot of the Goseck circle recreation.

<https://commons.wikimedia.org/wiki/File:WoodHenge-Goseck-Germany-Ringwalk.jpg>

Archaeologist Ralf Schwarz believes that the construction of the site made it possible to coordinate the lunar phases with the more difficult measurements of the solar cycle.
(Schwarz, Neolithic Circular Enclosures in Europe)

On the island of Malta the Neolithic temple, Mnajdra, (c.3600 BC – c.3200 BC) is aligned with the summer and winter solstices and also to the equinoxes. It is like a yearly 'clock' because the time of year can be read each morning by the position of the sun's rays on the stone.



"Schematic Angles in the Mnajdra solar temple in Malta."

https://commons.wikimedia.org/wiki/File:Schematic_Angles_in_the_Mnajdra_solar_temple.tif

Writing about Neolithic monuments and megaliths, Michael Gantley of *National Geographic* wrote, "The incorporation of astronomical alignments suggests that Neolithic ceremonies were closely bound with the changing seasons. These cycles were critical to agrarian communities..." (Gantley, Europe's Mighty Megaliths "Rock" the Winter Solstice)

ABOUT THE NEOLITHIC TIME PERIOD

While scholars refer to the Neolithic time period, the start and end vary considerably depending on the location and the materials that were available. About 10,000 years ago some of the first Neolithic cultures came about in the Middle East; they made many of their items with reeds. Around three thousand years later, the Neolithic emerged in Europe with wood being a major material.

In addition, there was a transitional time period called the Mesolithic which occurred between the Upper Paleolithic and the Neolithic. During this time nomadic tribes often settled into one place for several months during the year. Like the Neolithic, the Mesolithic time period and nature of the transition varied considerably.

SPIRALS AS SYMBOLS FOR LIFE CYCLES



LEFT: Ancient Greek Pottery: Greek Prehistory Gallery, National Museum of Archaeology, Athens, Greece.

https://commons.wikimedia.org/wiki/File:Ancient_Greece_Neolithic_Pottery_-_28171028800.jpg

RIGHT: Romanian pottery, 5th millennium BCE. Museum of Prehistory and Early History, Berlin.

https://commons.wikimedia.org/wiki/File:Museum_für_Vor-_und_Frühgeschichte_Berlin_095.jpg

Drawings and images of spirals occur throughout Neolithic societies. The most famous, the triple spiral, was found in the monument at Newgrange Ireland. But these images appear in most Neolithic cultures. Many experts today think that these spirals represent the cyclical nature of the year and of reality itself.



The famous Tri-Spiral in the chamber at Newgrange.

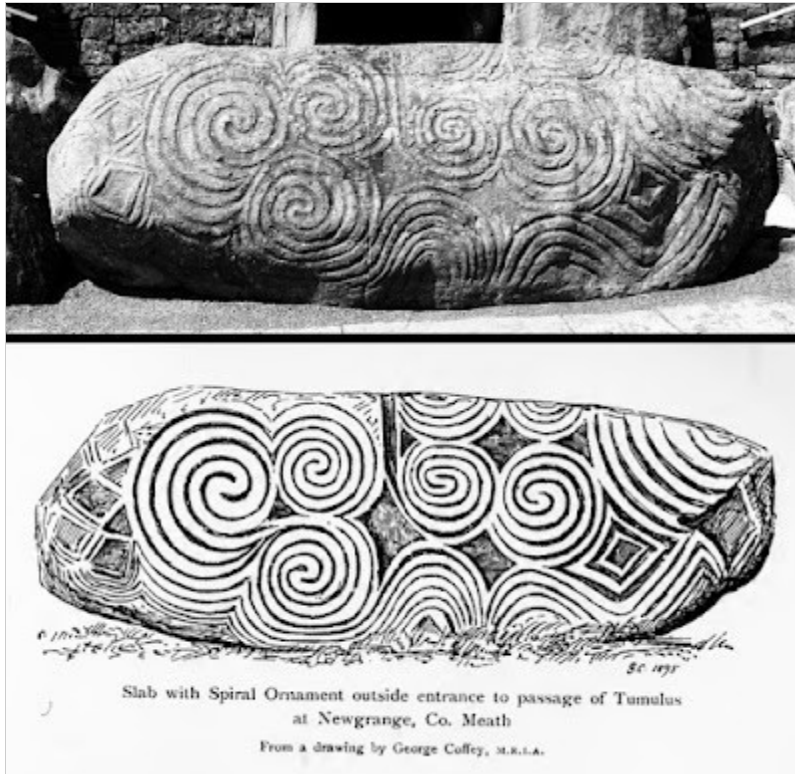
[https://commons.wikimedia.org/wiki/File:Newgrange_\(Sí_an_Bhrú\)_Monument,_Donore,_Éire.jpg](https://commons.wikimedia.org/wiki/File:Newgrange_(Sí_an_Bhrú)_Monument,_Donore,_Éire.jpg)

In Ireland, for example, the triple spiral is thought of as a symbol for the universal cycles of life.

"The triple spiral is thought to represent Birth, Life, and Death, or Man, Woman, and Child, signifying the unending cycle of life"

"This close pattern of spirals is the most common of all motifs decorating Celtic tombs, and one that is basic to all Celtic art."

(Irish Traditions, The Spirals of Newgrange)



TOP: The large stone at the entrance to Newgrange

https://commons.wikimedia.org/wiki/File:Newgrange,_Meath.jpg

BOTTOM: A drawing of the large stone showing the spiral engravings.

Coffey, George. Drawings of Newgrange from the late 1800s. Published in: *The Dolmens of Ireland*, by William Copeland Borlase. Published by the University of Michigan Library (January 1, 1897).

The following quote is consistent with my ideas about Neolithic time being long-term, unlike Paleolithic time which was immediate. If spiral images did represent yearly cyclical time, it is significant that these symbols did not take hold until the Neolithic.

"The spiral motif is rare in European rock art sites from the Upper Palaeolithic [approximately 40,000 to 12,000 years ago]. According to Genevieve Von Petzinger, it is strange that it is not present more often considering...how central this motif becomes in later time periods...The spiral does not become a regular occurrence in Europe until after the Upper Palaeolithic."
(Bradshaw Foundation, Ancient Symbols in Rock Art: The 'Spiral')

THE NEOLITHIC ABILITY TO WORK WITH COMPLEX PROCESSES

Building on the experiences of the Paleolithic era, Neolithic societies had an in-depth knowledge of the properties of plants, animals, and minerals. With plants, for example, this knowledge not only included the composition of the vegetation but also its cycle -- as some qualities were only present at certain seasonal points. And they were skilled at developing and refining processes to suit their needs. They knew, for example, that properties could be altered through processes such as heating clay to a high temperature to make pottery.

POTTERY (NEOLITHIC)

The ability to make successful pottery was "linked to improved skills in pyrotechnology (firing at the correct temperature) and was finally gratified during the Neolithic Period.

"Pottery art is a complex and time-consuming process that presupposes a knowledge of all its stages: choice of suitable clay, removal of impurities (manually or by sieving) and clay preparation...and firing at a temperature up to 850-900 Celsius (1562-1652 Fahrenheit)"

(Hellenic Foundation, Neolithic Pottery)



LEFT: Cucuteni (a Neolithic Culture) kiln reconstruction, Cucuteni Neolithic Art Museum, Piatra Neamt, Romania.

https://commons.wikimedia.org/wiki/File:Cucuteni_oven_reconstruction.JPG

RIGHT: Pottery, Neolithic, the Cucuteni Culture, 4300-4000 BCE. Found in Scânteia, Iasi, Romania. Collected by the Moldavia National Museum Complex.

<https://commons.wikimedia.org/wiki/File:%E5%BA%93%E5%BA%93%E7%89%B9%E5%B0%BC%E9%99%B6%E7%A2%97%E9%99%B6%E7%BD%90.JPG>

5,000 YEARS OF MAKING LINEN: THE HISTORY OF NEOLITHIC FLAX PROCESSING

"Archaeobotanists Ursula Maier and Helmut Schlichtherle reported evidence of the technological development of making cloth from the flax plant (called linen). [ED: during the Neolithic]

"Making cloth from flax is not a straightforward process.

"Flax is a bast fiber plant--meaning the fiber is collected from the inner bark of the plant--which must undergo a complex set of processes to separate the fiber from the woodier outer parts.

"They report that evidence for Alpine lake house [Neolithic] flax fiber production includes tools (spindles, spindle whorls, hatchets), finished products (nets, textiles, fabrics, even shoes, and hats)...They discovered, amazingly enough, that flax production techniques at these ancient sites were not dissimilar from that used everywhere in the world through the early 20th century."

(Hirst, 5,000 Years of Making Linen)



LEFT: Woman's linen dress, Smolensk Linen museum, Smolensk, Russia.

https://commons.wikimedia.org/wiki/File:«Smolensk_Linen»_museum_-_001.jpg

RIGHT: Man's outfit, Smolensk Linen museum, Smolensk, Russia.

https://commons.wikimedia.org/wiki/File:«Smolensk_Linen»_museum_-_058.jpg

----- THINKING BIG

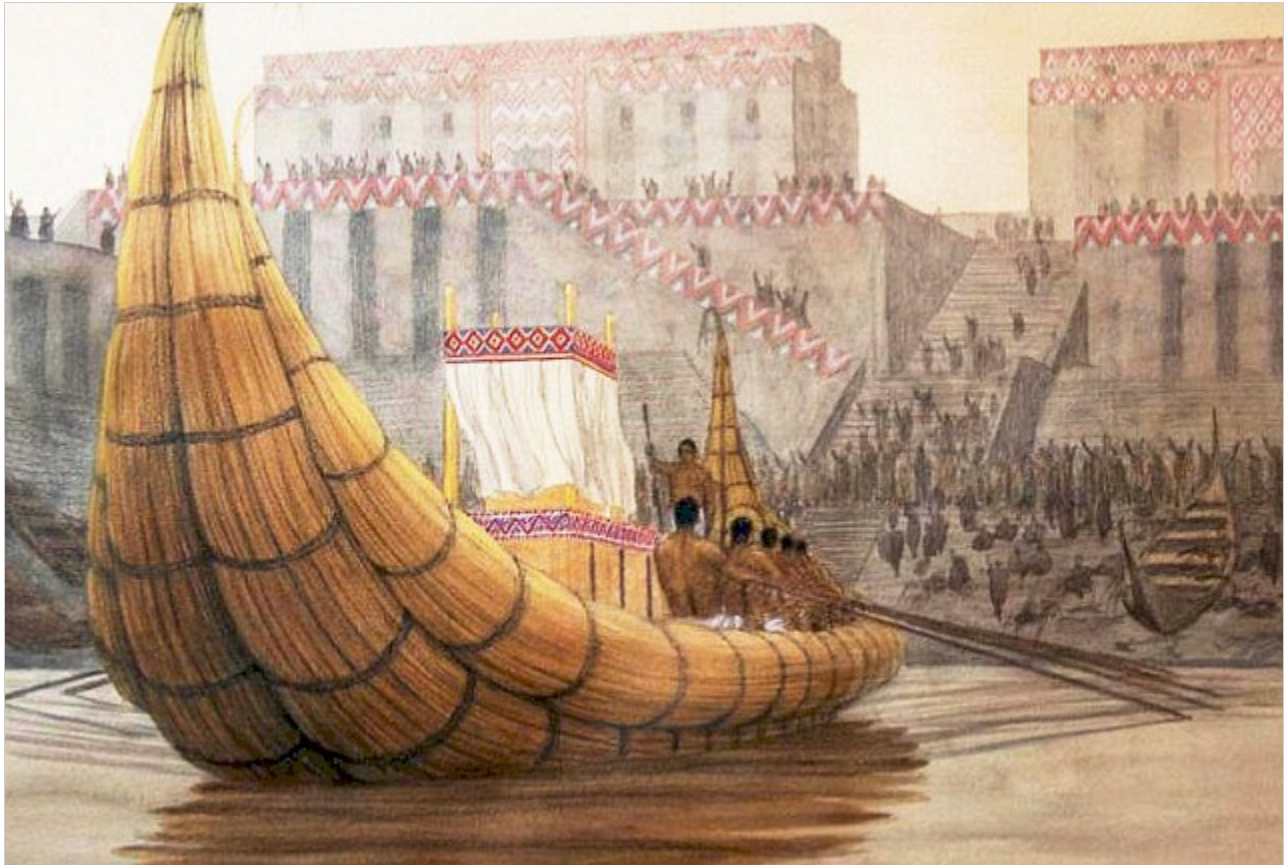
One of the characteristics of the Neolithic era was that they could 'think big'. So basic basket weaving technology could be used to make small reed boats and then very large boats, for example, as described next. And that same basket weaving technology could be used to make small reed huts for a family and then very large buildings for a community.

THE NEOLITHIC ORIGINS OF SEAFARING IN THE ARABIAN GULF

"Navigation in the Gulf during the Neolithic and Ubaid periods

"The new discoveries...allow us to speculate on the mechanics of trade during the sixth and fifth millennia BC. First, the question of whether boats were used during the Neolithic period has been answered positively. The vessels were made of reed bundles, lashed together, and then coated with a bitumen amalgam – a technology that prefigures the techniques used to build trading vessels during the Bronze Age, some 3000 years later."

(Carter, Neolithic origins of seafaring in the Arabian Gulf)



While this large reed boat would have been constructed for a post-Neolithic Mesopotamian civilization, smaller ships with this general design were used in the Neolithic.

[LINK](#)

BITUMEN

"Analysis of the material from Ras al-Jinz has shown that the bitumen was combined with chopped reeds, carbonates, and possibly fish oil, to make an amalgam. This process changed the physical properties of the bitumen, making it adhesive, tough, flexible, and light." [ED: This shows that during the Neolithic era, an understanding of materials and their properties was quite advanced.]
(Carter, Neolithic origins of seafaring in the Arabian Gulf)

MUDHIF



"A mudhif, a traditional Marsh Arab guesthouse made entirely out of reeds.
The Marsh Arab live a lifestyle that dates back 5,000 years."

(U.S. Army Corps of Engineers, A mudhif)

LEFT: "The village headmans house, people of the marshes 1978."

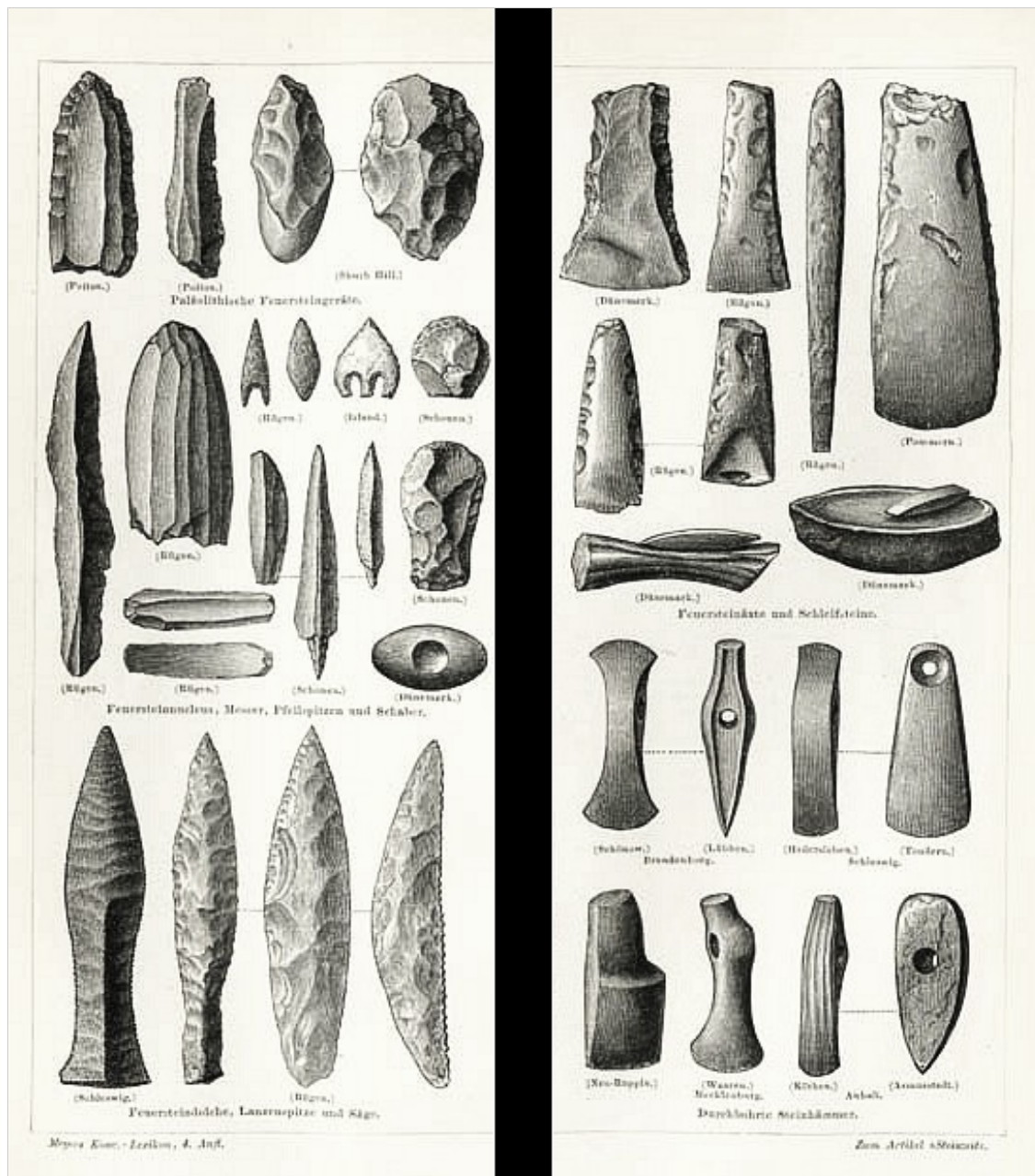
https://commons.wikimedia.org/wiki/File:The_village_headmans_house,_people_of_the_marshes_1978_-_panoramio.jpg

RIGHT: Mudhif Reception Hall.

[https://commons.wikimedia.org/wiki/File:Mudhif_Reception_Hall_\(30943793762\).jpg](https://commons.wikimedia.org/wiki/File:Mudhif_Reception_Hall_(30943793762).jpg)

NEOLITHIC (NEW STONE AGE) TOOLS WERE A MAJOR ADVANCE OVER OLD STONE AGE TOOLS

When I was in college I asked my Modern Civilization professor what was the reason for polished stone tools in the Neolithic era, the technology that defined the era and gave it its name, the New Stone Age. He did not have an answer. I asked another knowledgeable person several years ago and they did not know either. Clearly, this has not been understood until recently when some archaeologists used such tools to cut down a few trees and, as a result, began to see their value. These tools were not just somewhat advanced; they worked very differently and effectively. For example, they chopped down trees quickly and the tools remained sharp. They also worked well when it came to carving and shaping wood to make a variety of items. But dismissing these tools as merely a slight advance in stone tool technology was a mistake and was one of the reasons why the New Stone Age has not been given its due.



LEFT: Paleolithic 'flake tools'.

RICHT: Neolithic polished tools.

Page 280, Volume 15 of the German illustrated encyclopedia Meyers Konversationslexikon, 4th edition (1885-1890).

https://commons.wikimedia.org/wiki/File:Meyers_b15_s0280a.jpg

"The Neolithic Period, or New Stone Age, the age of the ground tool, is defined by the advent around 7000 BCE of ground and polished celts (ax and adz heads) as well as similarly treated chisels and gouges...A ground tool is one that was chipped to rough shape in the old manner and then rubbed on or with a coarse abrasive rock to remove the chip scars...Polishing was a last step, a final grinding with fine abrasive. That such a tool is pleasing to the eye is incidental; the real worth of the smoothing lay in the even cutting edge, superior strength, and better handling. The new ax would sink deeper for a given blow while delivering a clean and broad cut; its smooth bit, more shock resistant than the former flaked edge, had less tendency to wedge in a cut."

(Britannica, Neolithic Tools)

Read the excellent complete detailed
but concise *Britannica* articles
about Neolithic hand tools
<https://www.britannica.com/technology/hand-tool/Neolithic-tools>
And the Neolithic Era in Europe
<https://www.britannica.com/event/Neolithic>



"A Neolithic stone axe with a wooden handle. Found at Ehenside Tarn, now in the British Museum."
https://commons.wikimedia.org/wiki/File:Neolithic_stone_axe_with_handle_ehenside_tarn_british_museum.JPG

"The polished Neolithic ax, a heavy implement, was in sharp contrast to the delicate small-rock work of the last stages of the Paleolithic period.

"In a revealing experiment, 4,000-year-old polished rock axes, furnished by the Danish National Museum and carrying the sharpness left after their last use 4,000 years ago, were fitted with ash handles modeled after that of a Neolithic hafted ax preserved in a bog, giving the ax an overall length of nearly 63 cm (25 inches). (A modern steel felling ax has a 91-cm [36-inch] handle.) When these were used in a Danish forest, it was soon found that the violent action of the modern technique of swinging a steel ax and putting shoulder and weight behind the blade to give long and powerful blows was disastrous, either ruining the edge or breaking the blade. Proper handling meant short quick strokes that chipped at the tree...

"After getting into form, the men found it possible to fell an oak tree more than 0.3 metre (1 foot) in diameter in half an hour or a pine 61 cm (2 feet) in diameter in less than 20 minutes. One-eighth acre (600 square yards, or 0.05 hectare) of silver birch forest were cleared by three men in four hours. One axhead cut down more than 100 trees on its original (old) sharpening."
(*Britannica*, Neolithic Tools)

WOOD TECHNOLOGY BEGAN AS A RESULT OF NEOLITHIC TOOLS



A Neolithic hut at the archeoParc in Schnals, South Tyrol, Italy.

https://commons.wikimedia.org/wiki/File:Archeoparc_-_H%C3%BCtte_3a.jpg

"Wood began its broad role in human life with the ground and polished tools of the Neolithic. Home and fire, furniture and utensils, cradle and coffin were products of the ax, adz, and chisel, which could fashion wood intricately and with precision. This kit of tools turned wood into an almost universal building material, for a host of new things was now possible, such as dugout canoes of oak, paddles and framing for hide-covered boats, sledges, skis, wooden platters and ladles, as well as other household gear."

(Britannica, Neolithic Tools)



Reconstructed Neolithic longhouse in the Archaeological Open-Air Museum in Oerlinghausen, Germany.

<https://commons.wikimedia.org/wiki/File:Arch-Freil-Oerlinghausen-Langhaus.jpg>

https://commons.wikimedia.org/wiki/File:Jungsteinzeit_AFM.jpg

NEOLITHIC SHOES (OF OTZI THE ICEMAN)

The discovery of a ca. 5000-year-old (between 3400 and 3100 BCE) natural mummy called Otzi the Iceman, who was found frozen in the Alps, uncovered a wide range of new information about Neolithic technology. He was discovered in 1991 and is part of the current rethinking about the sophistication of the Neolithic time period. His equipment and shoes, for example, showed that Neolithic people used natural materials in an extremely complex way. They understood animal, plant, and mineral properties and often combined them for maximum effect. But they also understood design, as Otzi's shoes were practical and comfortable.

His well-preserved shoes, scientists discovered were carefully made of different skins and fibers, each used for its particular qualities. "Microscopic studies of the leather showed that it came from calf on the bindings, deerskin on the uppers, and bearskin on the soles. Following the boot's structure, the researchers re-created a net made of thin bark strips and stuffed it with hay, which formed a lining that kept the foot warm and cozy." Then according to Hlavacek, a bootmaker who walked in the Alps in these reconstructed shoes, "these boots offered more contact with the ground's surface than modern shoes and felt like 'walking barefoot, but only better.'"

(Origjanska, Expert re-creates the shoes of 5,300-year-old Ötzi the Iceman)



Reconstruction of the Ötzi shoes by Anne Reichart.

"The inner braid is made of twisted and twisted cords made of linden bast, the outer shoes made of deerskin with bearskin soles. An insulating layer of dry grass is held in place around the shoe by an inner mesh made of twisted and twisted linden bast cords." (Reichert, wikipedia.org)

https://de.wikipedia.org/wiki/Anne_Reichert

THE LASTING LEGACY OF THE NEOLITHIC ERA

Many important industries and practices began in the Neolithic and continue until today or until recently. This not only demonstrates their skill but their ability to create and craft important long-lasting processes.

WEAVING

Weaving basics remain essentially the same after its invention in the Neolithic.



LEFT: Reconstruction of a Neolithic loom around the time that Otzi, the Neolithic frozen 'ice man', was alive (ca. 3300 BCE), archeoParc in Schnals, South Tyrol, Italy.

RIGHT: Clothing woven by this loom, archeoParc in Schnals, South Tyrol, Italy.
https://commons.wikimedia.org/wiki/File:Archeoparc_-_Ötzi_Webstuhl.jpg

The famous Anni Albers of the Bauhaus School had this to say.

"During the 4,500 years or, in some estimates, even 8,000 years that we believe mankind has been weaving, the process itself has been unaffected by the various devices that contributed to greater speed of execution. We still deal in weaving, as at the time of its beginning, with a rigid set of parallel threads in tension and a mobile one that transverses it at right-angles."

This basic insight about right-angles has never been overshadowed. Anni Albers went on to say, "And weaving, even the most elaborate, can be done, given time, with a minimum of equipment...Fabrics of great accuracy have been executed without much mechanical aid."

(Albers, On Weaving)

WARP-WEIGHTED LOOM



Reconstruction of Neolithic warp-weighted loom
at the National Museum of Textile Industry in Sliven, Bulgaria.
<https://commons.wikimedia.org/wiki/File:Reconstruction-of-neolithic-loom.jpg>

Warp-weighted loom: Some of the Neolithic-type looms were still being used up until about 50 years ago in Scandinavia.

FOUNDER CROPS AND THE ORIGINS OF AGRICULTURE

Many core crops of the Neolithic are still important today.

NOTE: While einkorn wheat and emmer wheat are not grown as much today as they used to, they were major crops until recently. But five of these founder crops are still widely consumed today.

"The Eight Founder Crops, according to long-standing archaeological theory, are eight plants that form the basis of origins of agriculture on our planet. All eight arose in the Fertile Crescent region (what is today southern Syria, Jordan, Israel, Palestine, Turkey and the Zagros foothills in Iran) during the Pre-Pottery Neolithic period some 11,000–10,000 years ago. The eight include three cereals (einkorn wheat, emmer wheat, and barley); four legumes (lentil, pea, chickpea, and bitter vetch); and one oil and fiber crop (flax or linseed).

These crops could all be classed as grains, and they share common characteristics: they are all annual, self-pollinating, native to the Fertile Crescent, and inter-fertile within each crop and between the crops and their wild forms."

(Hirst, The Eight Founder Crops)

POTTERY

Based on detailed information from the visual-arts-cork.com pottery timeline, virtually all pottery/ceramics fundamentals had been invented in the Neolithic, including tourneys/tournettes which were early potter's wheels (4700 BCE).
(Visual-Arts-Cork, Pottery Timeline)

CORACLE BOATS

Still widely used today in the Middle East and in Asia, the coracle was a boat of the Neolithic era.



LEFT: Small coracles are still widely used throughout the world.

https://commons.wikimedia.org/wiki/File:Hogenakkal_Coracle.jpg

RIGHT: A coracle can be quite large and carry over 10 tons.

<https://en.wikipedia.org/wiki/File:Kuphar.jpg>

"Neolithic navigation: The coracle was surely used for fishing, hunting, and commercial activities."
(Ancient-Cities, Neolithic navigation: The coracle)

The Use Of Stone Tools Continued For Thousands Of Years And Was Not Quickly Replaced By Metal Tools

"Stone tools maintained themselves during the Metal Age, yielding only slowly to the new material, which was expensive and the product of special skills. The copper and bronze tools and weapons... that constitute impressive displays in museums were rare luxuries. "
(Britannica, Neolithic Tools)

CONCLUSION

For this article, I chose a range of technologies that showed how the Neolithic cultures met basic needs, those of food, clothing, and shelter plus tool and utensil making.

While I spent a good deal of time detailing how these cultures developed and used these technologies, my main point is the following. They could not have done any of this without a clear

understanding of long-term linear time. Their way of life and their processes required long-term linear thinking. Their technology could not have been accomplished otherwise.

So I believe that by going into detail I have shown that they must have possessed this new sense of time. And this new sense was quite different from the immediacy of the Paleolithic era. It was a game-changer. I think they believed that cosmological time was cyclical, but season to season time was linear and that within the cycle of yearly time, long-term linear time was how the world operated.

Understanding this meant that humans had a new productivity tool. Learning to work with extended linear time and plan long-term gave them a power that they never had before.

Neolithic long-term linear time was a concept that was similar to our own. And this was a radical break with earlier conceptions of time. The main difference between modern time and Neolithic time is that Neolithic cultures saw overall time, cosmological time, as being cyclical. But now in the modern world, we see all time as being linear -- starting with the Big Bang 13.8 billion years ago.

Yet the basic idea of long-term linear time began in the Neolithic. Instead of seeing time as a flow over which they had no control, time was now seen as something that could be understood and used to human advantage; it could be harnessed. Time was now seen as a commodity, a resource that could be tamed and domesticated, just like the crops and the farm animals.

And this new conception of time was a giant cognitive leap for mankind.

"Whether a temple or a grave, ancient people often brought their mundane activities into cosmic synchrony - a cadence of time and space frozen into stone."
(NASA, Designing Your Own Newgrange Tomb!)

AFTERWORD

Long-lasting Neolithic designs



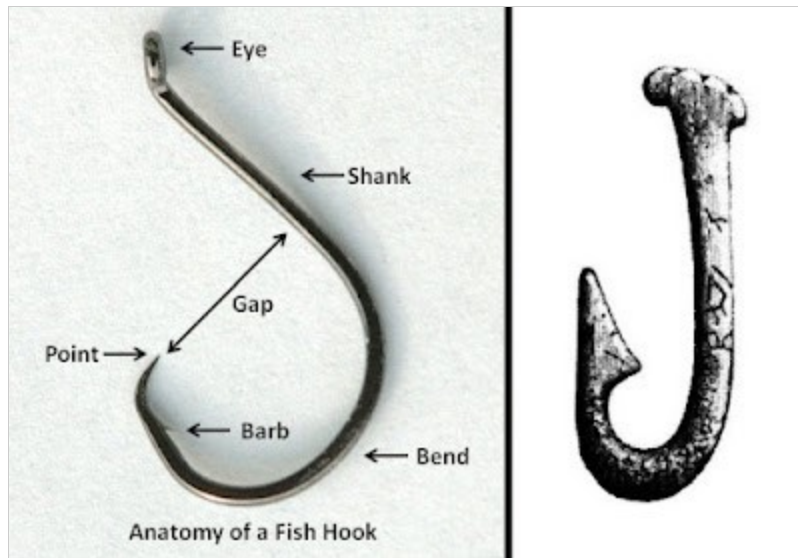
LEFT: A reconstruction of a Neolithic building

"The Stone Age Horton House as constructed at Butser Ancient Farm 2020." Petersfield, England.

https://commons.wikimedia.org/wiki/File:Butser_Ancient_Farm_Horton_House.jpg

RIGHT: Making a modern thatched roof today.

https://commons.wikimedia.org/wiki/File:Reetdach_P7040055.JPG



LEFT: Anatomy of a fish hook.

<https://commons.wikimedia.org/wiki/File:Anatomyofafishhook.jpg>

RIGHT: "Fishing hook of bones from the Stone Age, found in Skåne, Sweden."

https://commons.wikimedia.org/wiki/File:Metkrok_av_ben_från_stenåldern,_funnen_i_Skåne.jpg



Flip-flops: A Neolithic design that is still widely used today.

LEFT: A pair of 'flip-flop' sandals from the Middle Neolithic (5200 and 4800 BCE), Cueva de Los Murciélagos, Albuñol (Province of Granada, Andalusia, Spain).

[https://commons.wikimedia.org/wiki/File:Sandalias_del_Neolítico_de_Albuñol_\(M.A.N._Inv._595_y_596\)_01.jpg](https://commons.wikimedia.org/wiki/File:Sandalias_del_Neolítico_de_Albuñol_(M.A.N._Inv._595_y_596)_01.jpg)

MIDDLE: Ancient Egyptian flip-flops, circa 1580 –1479 BCE, Metropolitan Museum of Art.

https://commons.wikimedia.org/wiki/File:Pair_of_Sandals_MET_DT310791.jpg

RIGHT: Children's flip-flops, 1960, Museum Rotterdam, Rotterdam, the Netherlands.

https://commons.wikimedia.org/wiki/File:Blauw_en_witte_kunststof_kinder-teenslippers_met_Y-binding,_bovenkant_van_zool_wit,_onderkant_blauw,_objectnr_69397-1-2.JPG

ENDNOTES

Albers, Anni. On Weaving: New Expanded Edition. Princeton University Press, Oct 24, 2017, page 4.

Ancient-Cities forum. Plinio.Lisboa: "The coracle was surely used for fishing, hunting, commercial activities." Forum.Ancient-Cities.Com, Nov '18. <https://forum.ancient-cities.com/t/neolithic-navigation/4942>

Birch-Chapman, Shannon; Jenkins, Emma; et al. (2017) "Estimating population size, density and dynamics of Pre-Pottery Neolithic villages in the central and southern Levant: an analysis of Beidha, southern Jordan, Levant." The Journal of the Council for British Research in the Levant, Volume 49, 2017 - Issue

1. <https://www.tandfonline.com/doi/full/10.1080/00758914.2017.1287813>

Bradshaw Foundation. "Ancient Symbols in Rock Art: The 'Spiral'." https://www.bradshawfoundation.com/ancient_symbols_in_rock_art/ancient_symbols_in_rock_art.php

Britannica. "Neolithic Tools." Britannica.com. <https://www.britannica.com/technology/hand-tool/Neolithic-tools>

Carter, R.A. "Neolithic origins of seafaring in the Arabian Gulf." *Archaeology International*, 2912. pp 44-47. DOI: <http://dx.doi.org/10.5334/ai.0613>

Colapinto, John. "Has a remote Amazonian tribe upended our understanding of language?" *The New Yorker Magazine*, April 16, 2007. <https://www.newyorker.com/magazine/2007/04/16/the-interpreter-2>

Diamond, Jared, UCLA School of Medicine. "The Worst Mistake in the History of the Human Race" *Discover Magazine*, May 1987, pp. 64—66.

Gantley, Michael J. "Europe's Mighty Megaliths 'Rock' the Winter Solstice." *National Geographic*, November 12, 2017. <https://www.nationalgeographic.com/history/history-magazine/article/history-europe-megaliths-solstice>

GrainPro. "A Brief History Of Hermetic Storage." Grainpro.com. <https://news.grainpro.com/a-brief-history-of-hermetic-storage>

Hellenic Foundation, Greece. "Neolithic Pottery." http://ime.gr/chronos/01/en/nl/culture/nl_pottery.html

Hirst, K. Kris. "5,000 Years of Making Linen: The History of Neolithic Flax Processing." *Thoughtco.com*, May 20, 2019. <https://www.thoughtco.com/making-linen-history-neolithic-flax-processing-171347>

Hirst, K. Kris. "The Eight Founder Crops and the Origins of Agriculture Re-imagining the Beginning of Farming." *Thoughtco.com*, updated August 31, 2018. <https://www.thoughtco.com/founder-crops-origins-of-agriculture-171203>

History.com. Neolithic Revolution: Plant domestication. History.com Editors, Updated Aug. 23, 2019.

Irish Traditions. "The Spirals of Newgrange." *Irishtraditionsonline.com*, 2016. <https://irishtaditionsonline.com/the-spirals-of-newgrange/>

Kuijt, Ian & Finlayson, Bill. "Evidence for food storage and predomestication granaries 11,000 years ago in the Jordan Valley." *Pnas.org*. July 7, 2009. <https://www.pnas.org/doi/full/10.1073/pnas.0812764106> <https://doi.org/10.1073/pnas.0812764106>

Lecarme, Jacqueline, Ph.D., Linguistics. "Nominal Tense and Tense Theory." *Empirical issues in formal syntax and semantics*, 1999. https://www.academia.edu/2486019/Nominal_Tense_and_Tense_Theory

Lusk, Jayson. "The Evolution of American Agriculture." *Jaysonlusk.com*, June 27, 2016. <http://jaysonlusk.com/blog/2016/6/26/the-evolution-of-american-agriculture>

Mercer, R. "Background notes to Neolithic cosmology." 2014 ScARF Downloads. https://scarf.scot/wp-content/uploads/sites/15/2014/02/Mercer_cosmology_2014_0.pdf

NASA. "Designing Your Own Newgrange Tomb!" *P8Newgrange.pdf*, p.1. <http://spacemath.gsfc.nasa.gov/SED11/P8Newgrange.pdf>

Neolithic Circular Enclosures in Europe, International Workshop in Goseck (Saxony-Anhalt, Germany) 7.-9. Mai 2004 (abstracts).

Origjanska, Magda. "Expert re-creates the shoes of 5,300-year-old Ötzi the Iceman, down to the bearskin soles and hay-stuffed lining." *Thevintagenews.com*, Dec 12, 2017. <https://www.thevintagenews.com/2017/12/12/otzi-the-iceman-shoes/>

Schwarz, Ralf. "Neolithic Circular Enclosures in Europe. Circular ditch systems of the Stichbandkeramik culture in Saxony-Anhalt." (Kreisgrabenanlagen der Stichbandkeramikkultur in Sachsen-Anhalt.) International Workshop in Goseck (Saxony-Anhalt, Germany) 7-9 May 2004.

U.S. Army Corps of Engineers Digital Visual Library. "A mudhif, a traditional Marsh Arab guesthouse made entirely out of reeds." https://commons.wikimedia.org/wiki/File:Iraqi_mudhif_interior.jpg

Visual-Arts-Cork. "Pottery Timeline (c.26,000 BCE - 1900)." Encyclopedia Of Art. <http://www.visual-arts-cork.com/pottery-timeline.htm>