World of Patterns
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World of Patterns: A Global History of Knowledge.

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The search for patterns is as old as humanity itself and probably even older. More than 2.5 million years ago, *Homo habilis* began making increasingly complex stone tools. And some 500,000 years ago, *Homo erectus* scratched a geometric zigzag pattern on a shell, the meaning of which is unclear. The control of fire also dates from this time. These events occurred in the Paleolithic, or Old Stone Age, which runs from about 2.5 million years ago to 12,000 years ago. This period is followed by the New Stone Age, or the Neolithic, when people began practicing agriculture and keeping livestock. While *Homo erectus* spread from Africa across Europe and Asia more than a million years ago, *Homo sapiens* was still hiding out in a remote corner of Africa. Around 70,000 years ago this “wise man” also began to populate the other continents. Around this time something special happened: *Homo sapiens* manifested an outburst of creativity. We see this in the form of the many cave paintings, records of the phases of the moon, increasingly refined tools, and the development of a precursor to writing. Some historians even speak of a cognitive revolution in the late Paleolithic and attribute it to genetic mutation, for lack of a better explanation.
What exactly happened during this cognitive revolution or “leap” is unclear, as is the answer to the question of whether it might be better to think of it as a development rather than as a leap. But what is undeniable is that a certain acceleration occurred at that time, one that was crucial for the history of knowledge. At the end of the Paleolithic, *Homo sapiens* was the only one of the many human species remaining, together with the last few Neanderthals, who disappeared some 34,000 years ago. For this reason, when I discuss humans in this book, I am referring primarily to *Homo sapiens*, unless otherwise indicated. In our study of the search for patterns in the Stone Age, we are, of course, dependent on unwritten sources.

1.1 The Paleolithic: From Primal Human to Jack-of-All-Trades

*The Oldest Shared Pattern in the World*

It was in the summer of 1983 when I was traveling around southern Europe as an 18-year-old that I first heard about the cave paintings at Altamira. These prehistoric caves had been closed to the public for years but could finally be seen again, though not for long, unfortunately: the air exhaled by visitors proved to be so harmful to them that nowadays people have to make do with a replica. So I arrived at the right time and was overwhelmed by the staggering number of images of bison, deer, horses, and wild boar (figure 1).

The paintings are so realistic that when they were discovered in 1878, archaeologists didn’t want to believe that they dated from the Paleolithic. In their opinion, a “primitive” human would have been unable to produce this sort of artwork, and the person who had discovered the drawings was accused of forgery. But similar caves were soon found in Spain and France. Radiometric dating methods have now established that these paintings range from 20,000 to 40,000 years old. We also know how they were made. Each image was painted in three phases: the figures were first scratched into the rock with a sharp object, then they were outlined with black charcoal, and finally they were colored with ocher.

What is particularly striking is the systematic way in which the bison, horses, wild boar, and other animals are depicted. The prehistoric painters followed a particular pattern in how they represented the animals’ positions and actions: they are painted in profile, that is, from the side. The animals are depicted with all of their legs, their tail, and—when applicable—with both horns. The painters apparently wanted to show as much of the animal’s body as possible, which required
drawing it from the side rather than from the front. We find the same pattern in other Paleolithic paintings, such as the well-known Apollo 11 caves in Namibia, the Sulawesi caves in Indonesia (figure 2), and the Cueva de las Manos in Argentina, although the latter is not as old (between 13,000 and 9,000 years), considering that Homo sapiens didn’t arrive in the Americas until around 13,000 years ago.

In addition to the sideways portrayal, we also find a pattern in the cave paintings known as “twisted perspective”: the heads of the animals are shown in profile, but the horns are shifted in relation to each other, or twisted, making them clearly distinguishable. Apparently the horns were too important to be overlooked, unlike the eyes, for example. We also encounter images of people, especially their hands. Such stencils of hands can be found all over the world. They were probably made by blowing or spraying liquid ocher over a hand, as in the Sulawesi cave paintings in figure 2. In addition, we sometimes see representations of depth illusions. An example of this is in the Altamira cave, where a relief of the rock face was used to evoke depth. The contours of animal bodies follow the bulges in the wall, rendering the images three-dimensional. The result is of unsurpassed beauty. Picasso allegedly had this to say on a visit to the cave: “After Altamira, all is decadence.”
While all the patterns we are discussing here are unambiguously present, they remain implicit and were only identified by people studying them. There are no inscriptions or texts that mention the pattern of the side view or twisted perspective. All we have is the images themselves.

*Astronomical Knowledge: Explicit Patterns*

In other forms of prehistoric knowledge, patterns can also be found that are more explicit, such as the oldest known observations of the lunar cycle. These have been transmitted through inscriptions on thousands of bone fragments of reindeer and mammoths on which people kept track of the phases of the moon. For example, the long lines on the mammoth tusk from Gontzi (figure 3) seem to refer to the days with the new moon and full moon, while the short lines refer to the days in between. Bones and tusks of this kind have been found at various sites in Africa and Europe and are between 15,000 and 40,000 years old.
Although the lunar interpretation of these dash patterns is generally accepted by archaeologists and archaeoastronomers, we have no conclusive evidence that they actually concern the lunar cycle. Yet the indications are strong. To start with, moonlight was of great importance to Paleolithic humans, who depended on it for the nocturnal hunt. Second, the cycles in the dash patterns are subdivided into smaller cycles, which—though not always consistently—represent the first and last quarters of the lunar phases (the half-moons). But even if the pattern were to refer to something completely different, for example, to a woman’s menstrual cycle, it is still an explicit representation of a pattern. In addition, the count appears to have been tallied using dashes, making the pattern one of the oldest quantitative representations known.

A different lunar cycle pattern appears to be engraved on the 30,000-year-old Blanchard bone from Sergeac in France (figure 4). Here it is the lunar phases themselves that appear to be depicted. With a little bit of effort, we can make out the waxing and waning moons, but there is no clear cycle in the lunar phases on the
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Bone. Moreover, the images include all sorts of details whose meaning is unclear. This has led some archaeologists to suggest that the Blanchard bone had a primarily decorative character and does not represent observations of the moon.9

However, most Paleolithic lunar observations resemble the Gontzi dash patterns. Viewed from a certain distance, this system bears a degree of similarity to that of cave paintings. Of course, the dash patterns are abstract while the animals are figural. But both cases involve the noting and recording of shapes, be they of animals or of the moon. It has also been suggested that certain constellations of black dots in the Lascaux cave paintings show similarities to star constellations in the sky, especially the Pleiades. This would mean that the Lascaux paintings are the first in which art and the cosmos come together.10

In any case, we can state that the conscious or unconscious search for patterns starts with Paleolithic humans and is at least 40,000 years old. We find this search among groups of people who were sometimes more than 12,000 kilometers apart and who were not in contact with each other. This suggests that Stone Age people already had this pattern-seeking creativity and took it with them when they left Africa to spread to other parts of the world.

Knowledge of Domestication: From Unconscious to Conscious Patterns

Paleolithic humans also gathered systematic knowledge in a completely different field: domestication, or knowledge concerning animal breeding and the cultiva-
Domestication involves selecting animals and plants for certain characteristics so that their offspring are better suited for human needs. Domestication can be used to cultivate tastier and more robust crops and to breed tamer and stronger animals.

It is almost certain that the oldest form of domestication—from wolf to dog—took place unwittingly. We know this through genetic research into the proto-dog, which split off from the wolf at least 33,000 years ago (but possibly as early as 100,000 years ago). This split was the result of self-domestication: over many generations, some wolves who were less afraid of humans than others gradually evolved into dogs through a process of “self-selection” by following people and eating their food scraps at campfires. This gave proto-dogs an advantage over their more fearful counterparts. People discovered that these animals could warn them of danger, help them hunt, and even serve as food in times of scarcity. A symbiotic relationship between humans and proto-dogs developed following an unconscious domestication pattern. But as soon as people became aware of this pattern and its benefits, they adopted it for breeding other animals as well, such as the further breeding of the dog itself (about 13,000 years ago). The dog was followed first by the goat, the sheep, and the pig (around 8000 BCE), and then later by the cow and the horse (6000 and 4000 BCE, respectively). But by that time we are in the Neolithic Age, with a pastoral peasant culture, and the unconscious selection pattern has become conscious.

Similar processes have occurred in the domestication of wheat and other crops. When the grain is ripe, wild wheat falls to the ground and goes to seed, but some of the grains remain on the stalk. This wheat remaining on the stalk could be harvested more easily and hence came to be domesticated—through an unwitting process. For its survival, this wheat depends on the farmer harvesting it and sowing it again. Here too, the unconscious pattern must have become a conscious one, as evidenced by the domestication of many crops in the later Stone Age. The first crop to be domesticated was probably rye (around 12,500 BCE), followed by other cereals such as wheat (9500 BCE) and peas (around 9000 BCE); fruit trees would follow millennia later. Awareness of the domestication pattern will become the driving force behind the “Neolithic revolution” that I discuss below, but the first seeds of this pattern were sown in the Paleolithic.

With domestication we find a transition from an unconscious pattern to a conscious one: human interaction with plants and animals triggers selection processes that lead to adaptations in them, after which this pattern is used to domesticate other species.
Awareness of the domestication pattern initially yielded no knowledge of the underlying principle. The underlying process was only discovered some 150 years ago by the likes of Gregor Mendel and Charles Darwin, while an understanding of the process in terms of genetics is even more recent. Darwin dubbed deliberate selection carried out by people “artificial selection,” contrasting it with his famous notion of “natural selection.” But the underlying principle is the same: since the second half of the 20th century, we have known that this deeper selection principle on which domestication depends is based on gene mutations and on new combinations of existing genes. So it can take a long time for a pattern to be reduced to its underlying principle; in the case of the domestication pattern, this took some 30,000 years. Of course, it is still possible that Stone Age people also formulated their own principles for the domestication pattern, but they are not known.

**Knowledge of Technology and Culture**

It goes without saying that the development from the chipped stone to the more advanced hand ax was also accompanied by a search for a pattern, namely for the best possible tool for a given purpose. But the hand ax may alternatively have been the result of a happy coincidence or some individual’s brilliant insight. This also applies to the making of spears, harpoons, arrows, and bows, and for the centuries-long improvement of the oil lamp, the oldest of which (ca. 15,000–10,000 BCE) was found in the caves of Lascaux and consists of no more than a stone dish filled with animal fat and a wick made of plant fibers.

Human control of fire is much older. Archaeological finds show that *Homo erectus* was already occasionally making fire a million years ago, and that around 450,000 years ago they were doing so systematically, just like the Neanderthals. From that time on, a new social pattern probably arose with evening campfires accompanied by communal meals and other social activities. This led to tighter group cohesion and a better understanding of others. Research into contemporary hunter-gatherer societies tells us that cultural transfer and group bonding does take place around campfires.

With one particular development, the pattern seems obvious: the survival strategies used in the ever-colder locations to which *Homo sapiens* migrated over the course of the late Paleolithic. For this emigration from Africa to Eurasia, increasingly sophisticated techniques were developed to make clothing that better held heat in. The most important tool was a needle made of bone or ivory, which
was gradually refined to seal animal skins off as well as possible from the cold. After 40,000 BCE this technique had been developed to the point that people around 15,000 BCE were able to survive at temperatures of −50°C (−58°F). This is an impressive feat of survival, one indebted to a unique human adaptation pattern: the more extreme the environment (in terms of temperature or some other factor), the more refined the technique (in this case the needle). It is a form of adaptation without genetic mutation.

The knowledge that Paleolithic humans possessed of their natural surroundings must have been tremendous. Stone Age humans could distinguish edible from inedible fruits, they knew the growth behavior of every plant, the course of rivers and streams, and the burrows of predators and prey, and they were experts at following animal tracks. It is obvious that Stone Age people used patterns for this. For example, knowledge about the growth behavior of plants and the habits of animals is almost by definition pattern based because it makes generalizations about individual plants and animals.

So Stone Age people had knowledge of many things and of many patterns, but what we do not find is knowledge of underlying principles that generalize over patterns. This doesn’t necessarily mean that they lacked this knowledge. But there is no indication that principle-based knowledge existed in the Paleolithic Age. And perhaps humans did not need such knowledge to survive.

Yet Paleolithic humanity must have had rules of law, rules for living together, for kinship, for rituals, for play, and for burying the dead, rules we could term “man-made patterns” or “cultural patterns,” though it is difficult to make a sharp distinction between patterns developed by people themselves and those found in the natural environment surrounding them (see the discussion in the conclusion). The numerous Paleolithic burial sites are also subject to a pattern: the tombs that have been found are aligned with the course of the midwinter or midsummer sun. In addition, burial gifts in the Paleolithic are evenly distributed practically everywhere we look, indicating a fairly flat social structure.

The current view is that Stone Age people were animists, just like the hunter-gatherers that remain today. According to animism, everything in the world has a soul: not just people but animals, plants, stones, mountains, and rivers as well, and even natural phenomena such as thunder and lightning. This abundance seems to indicate a world that lacks an underlying unity, since every object or being has its own soul or spirit. Although the evidence for animism from the Stone Age is paper thin, such an animistic worldview would fit well with the knowledge that Stone Age people had of their environment. They knew a great
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many patterns—botanical, zoological, geographical, artistic, astronomical, technological, and social—but all these patterns did not form a coherent whole.

Behold Paleolithic humanity, creatures that over the course of 2.5 million years evolved from primordial *Homo habilis* to the *Homo sapiens* jack-of-all-trades. These humans became aware of the many patterns in the world around them and stored them in their ever-expanding brains (there are indications that the human brain was at its largest in the late Paleolithic, only to decrease again in size starting in the Neolithic). But an awareness of patterns is not the same as an awareness of deeper underlying principles. A search for the “one in the many” was neither natural nor necessary for Stone Age peoples.

1.2 The Neolithic: From Jack-of-All-Trades to Specialist

*The Neolithic Revolution and the Inequality Pattern*

The greatest change ever to occur in the history of humanity was undoubtedly the transition from a food-gathering culture to a culture based on food production. After leading a nomadic life for 2.5 million years, humanity transitioned to sedentary life almost everywhere in the world. On a macrohistorical scale, this transformation took place at lightning speed: at around 10,000 BCE, people began producing food, including wheat, barley, and peas, in the Fertile Crescent (a contiguous area in the Middle East that includes parts of present-day Egypt, Israel, Palestine, Jordan, Kuwait, Lebanon, Syria, Iraq, Iran, and Turkey). Wherever a farming culture is established, the hunters and gatherers come under pressure. Around 7000 BCE, agriculture and animal husbandry spread from Anatolia to Palestine and Iran. At around the same time, people in Central America also transitioned to an agricultural lifestyle, with maize being the oldest crop (ca. 7500 BCE), even though there was no contact between the Old and New Worlds. Around 3500 BCE, we find agriculture and animal husbandry almost everywhere in the world. A radically different society emerged, where people settled in villages and lived in houses. Humanity itself became “domesticated” and formed a hierarchical society with much greater social inequality.

A great deal has been written about the causes of this Neolithic revolution and the emergence of social inequality. It is generally assumed that it was a shortage of land or food in combination with population growth that drove people to agriculture and livestock farming. But the unconscious domestication of plants and animals described above is also cited as the cause. Social stratifi-
cation and inequality are a product of the Neolithic revolution, but it’s not entirely clear which of the two is the cause and which is the effect. Moreover, the archaeological discoveries are ambiguous. All that can be deduced from research into the distribution of burial gifts, for example, is that social inequality thrives in a society with a permanent place of residence and a surplus of food. But this should not be taken to mean that social inequality arises only with the introduction of agriculture and animal husbandry. Food surpluses can also occur in a sedentary hunter-gatherer culture where food is stored, leading to unequal distribution of wealth. But such sedentary hunter-gatherer cultures always turn out to be in transition to pastoral or peasant life, and this transition from hunter to farmer brings further inequality. The possession of livestock leads to inherited wealth. Additionally, shepherds and farmers who specialized were more successful in expanding their livestock. This led to even more inequality, resulting in further specialization. While everyone seems to do almost everything in the Paleolithic, in the Neolithic we find specialized craftspeople, such as potters, masons, and weavers.

Like the domestication pattern, these patterns of specialization and (increasing) inequality were initially unconscious: they were no more than a by-product of the transition from a hunter-gatherer culture to a settled (peasant) existence. But as soon as Neolithic peoples became aware of the economic benefit of specialization, this initially unconscious specialization pattern came to be pursued consciously, along with the inequality pattern. So here again there is a process from an unconscious pattern to a conscious one.

This process is a recurring meta-pattern and therefore constitutes a recognizable trend in the history of knowledge: initially certain processes arise “organically,” such as the coevolution of humans and dogs, the random selection of plant characteristics (such as with wheat), and the increase in social inequality. But from the moment that people become aware of this pattern, they can either embrace the pattern or reject it. So far, we have seen only the embrace of patterns once people become aware of them, but we also find instances of rejection in this book. However, the pattern of inequality seems to have been embraced everywhere—at least by those at the top of the inequality curve. Rejection may have been impossible for those at the bottom of the inequality curve. For those at the top of the inequality curve who would have been able to reject it, there was no advantage in doing so.

This is what is called a positive feedback loop, where the pursuit of a certain pattern leads to another pattern, which in turn reinforces the earlier pattern. Or to be more precise, positive feedback occurs when A leads to more B, which in
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In the case of the inequality pattern, A is the specialization that leads to more inequality (B), which in turn leads to more specialization (A) (bearing in mind that specialization is not the only cause of inequality). If no adjustments are made from the outside, this process can go on indefinitely. The rich get richer and the poor get poorer—a meta-pattern known in modern sociology as the Matthew effect, based on the parable of the talents in the Gospel of Matthew: “For to all those who have, more will be given, and they will have an abundance; but from those who have nothing, even what they have will be taken away.”

It isn’t until the Bronze Age (ca. 3000–800 BCE; see chapter 2) that the population increases so much—and the concomitant inequality—that we can speak of the emergence of states with profound social stratification: with a monarch at the head, ruling over a priestly class, an army, and subjects, with enslaved people at the bottom of the heap. Moreover, each social layer is itself layered: subjects can be rich or poor traders, weavers, or farmers, just to name a few stations in life. Whereas someone in Mesopotamia in 6000 BCE could still be born into an egalitarian society, a few thousand years later he would come into the world as a crown prince, subject, or enslaved.

The inequality pattern is one of the most persistent patterns in human history. Despite the many attempts to contain it, this pattern has not died out since it first emerged in the Neolithic.

Knowledge of Technological Production Patterns

The sowing, growing, harvesting, and processing of crops required new tools. The typical tools from the Neolithic are the mortar and pestle, the digging stick, the (hook) plow, and the sickle. Milk production (from cows, sheep, goats, and horses) also led to a search for ways to make raw milk keep longer by processing it, since raw milk goes sour quickly. Thus we see the successive development of cheese (starting in 7000 BCE), butter (6500 BCE), and yogurt (2000 BCE).

Together with the development of new food products, a demand for storage also arose. Pots, barrels, and jars heralded the beginnings of pottery technology, in which water is extracted from molded clay by firing it, turning it into earthenware. Clay was also baked in the Paleolithic but mainly for art objects. The Neolithic furnaces could be fired up to around 900°C (1650°F), a temperature sufficient for earthenware but not for metalworking. At the end of the Stone Age, we do see the use of unprocessed copper for making axes, spearheads, arrowheads, and
other weapons. It was this sort of ax that was carried by Ötzi, the iceman mummy of fame, who dates from 3300 BCE and was found in the Italian Alps in 1991.28

Wool and cotton were also first produced in the Neolithic. Textile production can be described as a serial pattern: (1) sheep are sheered or cotton is harvested, (2) thread is spun, (3) looms are constructed, (4) cloth is woven, (5) cloth is dyed, and (6) garments are made.29 The first five of these steps were totally unknown in the Paleolithic. So, the transition from Paleolithic to Neolithic also entailed a transition from short to long production patterns, sometimes even serial patterns, which often consisted in subpatterns. It is partly these series-based production patterns that contributed to increasing specialization and social inequality.

Despite all the technological innovations, Neolithic people were no healthier than their Old Stone Age ancestors. Quite the opposite: the production and storage of grain and milk products led to a diet that was less varied and to people who were both unhealthier and smaller, as can be deduced from the skeletons found. This unbalanced diet resulted in more illnesses, while leading to more births because more children could be fed at the same time. The net effect was population growth and the emergence of the first cities, such as the walled city Jericho, which dates as far back as 7000 BCE.

Horizon Astronomy and Stone Circles: Construction Patterns

The New Stone Age shows increased knowledge of the movements of the sun and moon. This is evident from the thousands of rings of standing stones dating from around 7000 BCE that were constructed at various sites throughout the world. A stone henge consists of a group of large upright stones, called megaliths, arranged in the form of a circle or an ellipse. The number of megaliths per henge can vary considerably: from 4 to over 60. There can also be stones that lie sideways on the upright stones. The largest concentration of stone circles can be found in the British Isles and in Brittany. More than 1,000 have been found there, of which Stonehenge (ca. 2500 BCE) is the most famous.

It is usually thought that these stone circles served a religious purpose, but many also seem to have had an astronomical or calendar function.30 For example, when we look at Stonehenge from the center of the circle, the midsummer sun rises exactly behind the so-called Heel Stone (the top right stone in figure 5). The monument is also aligned with the midwinter sunrise, which like the midsummer sun corresponds to a solstice. The directions of sunrise at the beginning of spring and autumn are also indicated, on the equinoxes, when day and night...
are the same length. In addition, Stonehenge marks the more complex movements of the moon along the horizon. According to some archaeological astronomers, the central observation position is not at the center of the Stonehenge circle but at the Heel Stone itself. This would mean that Stonehenge focuses on the observation of the midwinter sunset rather than the midsummer sunrise. This is not entirely unlikely, since in many cultures the winter solstice is a metaphor for death and rebirth and is more important than its summer counterpart.

Whatever the case may be, everything indicates that Stonehenge shows a one-dimensional projection on the horizon of the movements of the sun and the moon. This is also referred to as horizon astronomy, in which patterns in the movements of celestial bodies are recorded over time along the horizon. For us, these patterns
remain implicit in the circular stone construction. So, the evidence for these patterns is indirect: we do not have inscriptions about what a ring of megaliths means or how it was used. And we know even less about what the builders of these stone circles thought about the sun and the moon. Did they consider these heavenly bodies to be gods? And was Stonehenge a holy place to them? All we know is that the monument marks the movements of the two most prominent celestial bodies.

If we compare the search for astronomical patterns in the Old and New Stone Ages, what is striking is that in the Paleolithic, as far as we know, the only search was for the lunar cycle, while in the Neolithic there was a search for a much larger number of patterns in movements of the sun and moon. This difference in the number of patterns sought and found is not surprising, considering that systematic knowledge of the seasons is vital for a food-producing culture, whereas it is of no importance, or at least of much less importance, for the hunter-gatherer life.

The Neolithic Revolution Depicted in Painting

The transition from a nomadic existence to a sedentary one can also be seen in painting. One of the murals from the Neolithic Anatolian settlement of Çatal Höyük (ca. 6,150 BCE) arguably represents the world’s oldest depiction of a landscape. In the foreground there are the rectangular houses of the town, while in the background a volcanic mountain rises that could be identified as Hasan Dağ. If this interpretation is correct, this wall painting would be the oldest known map of a settlement.

In other murals at Çatal Höyük, we encounter hunting scenes, which were also popular in the Old Stone Age. Although agriculture and animal husbandry were widely practiced there, hunting remained an important food source, as shown in the scene in figure 6 (from around 6000 BCE). However, this hunting scene is very different from the Paleolithic paintings in figures 1 and 2. We see a group of hunters working with something that looks like a red bull. The painter depicts the weapons in detail, including bows and arrows. But the most impressive aspect is the multitude of positions and actions of the hunters. Some of them are running, others are shooting, and yet others are watching the hunting scene. As in Paleolithic painting, a method is used in which only the most important parts of the bodies are shown: whereas the animals are depicted from the side, with humans only the head is shown from the side, while the torso with arms and legs are shown from the front.
So there seems to be a tendency running throughout the entire Stone Age: people and animals are depicted in such a way that the most important parts of their body are visible. For the depiction of people, this led to a front-on representation, while animals were drawn in profile. Furthermore, in Çatal Höyük we encounter a shift to a more narrative structure: whereas Paleolithic paintings mainly depict single animals, Neolithic paintings show an entire scene.

*On the Cusp of the Bronze Age and Early Antiquity: Knowledge of Writing*

If there is anything in which systematic knowledge in the later Stone Age is essentially different from that of the early Stone Age, it is in the early development of writing. Writing was not a sudden invention; it started with the first ideograms and pictograms. Ideograms express ideas or concepts, and if these signs resemble a physical object, they are referred to as pictograms. Combinations also occur.
The oldest of these characters are found in China (around 7000 BCE) and are known as the Jiahu characters. However, their meaning is unknown. There are also the Vinča characters from Romania from around 6000 BCE, which we are also unable to interpret, although it is assumed that they relate to rituals. The same applies to the Kish tablet from Sumer from around 3500 BCE, which contains the oldest form of proto-cuneiform script.

Like ideograms, pictograms are not suitable for expressing sentences consisting of multiple words. This is because in addition to content words—such as nouns and verbs—human languages also contain function words, such as articles, conjunctions, and demonstrative pronouns, which do not refer to physical objects as expressed by pictograms. One of the revolutionary developments in writing was the insight that function words could also be represented with signs. In this way, any sentence in a language could be expressed by a series of characters, representing variously content words or function words. Statements, reports, stories, hymns, laws, treaties, contracts, and so forth were recorded verbatim—the first time being in Sumerian script, called cuneiform because of its characteristic little “wedges,” cunei in Latin (see chapter 2). Although starting around 3000 BCE we are actually talking about the Bronze Age or early antiquity rather than the Stone Age, the transition from ideograms to alphabetic writing starts as early as the late Neolithic. At around 3400 BCE, we find a shift in cuneiform script from ideograms and pictograms to logograms (signs or characters representing a word or phrase). In addition, there was also a shift in the cuneiform script to phonograms: signs expressing sounds, much like the Latin alphabet, which developed later. The oldest phonograms were inspired by logograms, the sound of the phonogram corresponding to the first or last sound of the word to which the original logogram referred. One of the places where we see this is in the development of the precursors to the Latin alphabet, such as in Phoenician, where the first letter, aleph (today’s letter a), originally meant “ox,” and the second letter, beth (our letter b), initially meant “house.”

Although most writing systems (like cuneiform) have followed the process from ideograms, pictograms, and logograms to phonograms, this is not the case with all writing systems. Furthermore, a writing system does not indicate which combinations of signs produce well-formed words or grammatical sentences. The question of whether there is an underlying system (a grammar) that can predict the correct combinations of characters would not appear until centuries later (see chapter 3.1).
In any case, Sumerian cuneiform script was an overwhelming success: practically all peoples who came into contact with Mesopotamian civilization adopted the idea. However, it should also be mentioned that other peoples have developed writing systems independently of Sumerian, an example of which is the Zapotec script that we encounter around 600 BCE in Central America.

1.3 Conclusion: Stone Age Patterns from All Regions

Science and scholarship are usually thought to have had their beginnings in ancient Babylonia or even later, in classical Greece. However, the search for systematic knowledge appears to be thousands of years older than that, as we see in dash patterns representing the lunar cycles and the early development of writing. Moreover, the oldest remains of this search are in places tremendously far from each other. We conclude from this that people did not develop their pattern-seeking practices in Europe, Asia, Oceania, or America, but that they must have taken them with them when they left Africa. And many of the patterns found are still in use. These Stone Age patterns “of lasting value” include the pattern of domestication from the Old Stone Age and the patterns in the early development of writing in the New Stone Age. Domestication served as the engine for many later developments: breeding and growing led to a food-producing culture that became the driving force behind new technology and increasing specialization accompanied by social inequality.

From Unconscious Patterns to Conscious Ones

The transition from unconscious to conscious patterns is a recurring process and, as such, constitutes a tendency in prehistory. We encountered this with the domestication of plants and animals, as well as with the emergence of inequality. Domestication of the proto-dog initially took place unconsciously; afterward the technique was used consciously to domesticate other animals and plants. The pattern of inequality was also created unconsciously as a side effect of domestication and of the resulting transition to a sedentary culture, after which the pattern was maintained by those who benefited from the inequality. A process from unconscious patterns to conscious ones may also have taken place in the development of writing.

We can also describe the process of shifting from passive recognition of patterns to the conscious search for them as a transition from mere perception to
apperception (conscious perception) of patterns. The perception of patterns often occurs unconsciously and is not unique to humans: almost all animals perceive and use patterns. But it is highly questionable whether animals are consciously looking for patterns. And we have never detected deeper principles with animals, although we have yet to hear the last word on this question.

Implicit versus Explicit Knowledge

All Stone Age patterns are more or less implicit. For example, the pattern of side-view representation of animals can be deduced from the data only indirectly. The patterns of the lunar cycle engraved in bones are much less implicit since dashes are used to tally. However, no pattern is completely explicit unless it is described or explained as such. For this reason there is no evidence for the apparent transition from implicit to explicit knowledge in the Stone Age, and this naturally also applies to the aforementioned process from unconscious patterns to conscious ones. It isn’t until the Bronze Age, or early antiquity, that patterns are explicitly described for the first time.

No Awareness of Principles

In the Stone Age we perceive an awareness of patterns but no awareness of principles that generalize over patterns. The many Stone Age patterns do not show any further coherence, and this seems to correspond to the survival strategy of the Paleolithic human as a kind of a jack-of-all-trades. The Neolithic transition from jack-of-all-trades to specialist—or the transition from some knowledge about many things to an abundance of knowledge of some things—could have a parallel in the transition from the search for patterns to the search for principles: in both transitions we see a shift from many to one. But it isn’t until the Bronze Age that we find the first concrete principles (chapter 2).