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as much aesthetic sophistication as the Lascaux paintings, powerfully demonstrating that the first modern humans in Europe were already highly accomplished artists.²



Figure 3.1: Aurochs cave painting from Lascaux Cave

When you look at these intense artistic expressions, it's easy to understand what archaeologists mean when they say this was the time that humans achieved “cultural modernity.” We may not understand the precise significance of the Venus or the Lion-man, but there's no doubt they held symbolic meaning to their makers. This revolution in symbolic thought occurred across virtually every aspect of human behavior. For the first time, humans were sewing garments with fine needles; using kilns to bake ceramic figures; engaging in long-distance trade; utilizing storage facilities; and organizing their homes just like we do today, with different spaces for kitchens, sleeping areas, and eating. This period in history has been aptly summed up by Jared Diamond as humanity's “Great Leap Forward.”³

It's an impressive moment in history. However, some archaeologists have recently looked past these spectacular accomplishments to ask why it didn't happen sooner. It's generally agreed that humans were anatomically modern 150,000 years ago or earlier. Why did it take so long for symbolic thinking to get going? This rather awkward question was first framed by archaeologist Colin Renfrew, who referred to it as the "sapient paradox."⁴



Figures 3.2 a-d: Ivory bird, "Venus," "Lion-man" and bone flute from Hohle Fels Cave

Out of Africa

According to a growing number of experts, it actually did happen sooner. A lot sooner. In fact, there's evidence that the beginnings of cultural modernity may have occurred at least seventy-five thousand years ago. It's just that these early stirrings of modernity showed up not in Europe but in southern Africa. In recent years, excavations at Blombos Cave on the coastline of South Africa have uncovered startling new evidence of early symbolic behavior by our human

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ancestors. The findings include engraved ostrich eggshells probably used as personal ornaments, but the most striking treasure unearthed to date has been one particular piece of ochre engraved with a series of complex cross-hatches (figure 3.3). Renfrew and fellow archaeologist Paul Mellars feel certain that this deliberate patterning represents “the earliest unambiguous forms of abstract ‘art’ so far recorded” and suggest that “the human revolution developed first in Africa . . . between 150,000 and 70,000 years ago.”⁵



Figure 3.3: Ochre with cross-hatching from Blombos Cave

What does that say, then, about the Great Leap Forward? Doesn't it begin to seem like a series of steps rather than a great leap? Two archaeologists who think so, Sally McBrearty and Alison Brooks, have caused a stir arguing exactly this point, calling it “the revolution that wasn't.” Granted, some cross-hatching and engraved eggshells are not as impressive as the later explosion of symbolic thinking in Europe, but they are valuable clues to the origins of modern humans.⁶

In place of the Great Leap Forward, another epic story has moved into the foreground. The story, called by some “Out of Africa,” has emerged through advances in DNA analysis, which have enabled scientists to provide accurate time estimates regarding the migrations of different groups. Around seventy thousand years ago, a certain lineage of humans expanded throughout Africa, reaching as far north as Ethiopia. A small contingent, no more than a few hundred strong, then migrated across the mouth of the Red Sea, through Arabia and eastward along southern Asia until reaching Australia. At some point during this migration, a splinter group headed north into western Asia, eventually arriving in Europe, where their descendants would instigate the

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evolutionary biologists, Stephen Jay Gould and Richard Lewontin, once used them to illustrate an influential evolutionary theory. A spandrel doesn't, by itself, serve any purpose. It simply exists as an architectural by-product of the arches that hold up the dome. But if someone looked at the beautifully decorated spandrels without knowing anything about architecture, they would see them as an integral part of the architectural design. The living world, according to Gould and Lewontin, is full of evolutionary spandrels: features or functions that seem to have evolved for a specific purpose but, on closer evaluation, turn out to have been a superfluous by-product of something else.¹⁸



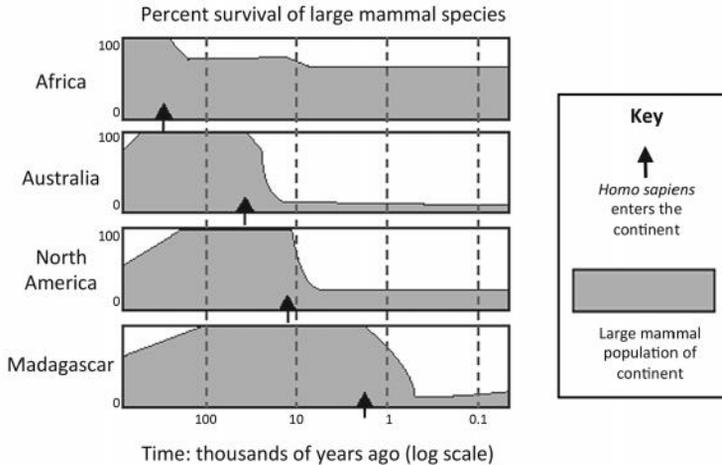
Figure 3.4: Spandrels in St. Mark's Cathedral, Venice

For some cognitive anthropologists, religion is a spandrel. By *religion*, they mean not just the organized religions we know in the modern world but the entire set of mythic constructions that virtually every culture has used from the earliest times to make sense of the universe. To understand how religion evolved, they believe, you need to look at some of the key functions of the modern human mind, and you will find that religion developed as their by-product. We're already familiar with several of these functions from what we know about the workings of the PFC, such as theory of mind, displacement (our ability for thinking about people even though they're distant from us), and our capacity to hold counterfactuals in our mind: things we can consider even though we know they're not true.¹⁹

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Maoris' arrival; in Cyprus, the pygmy hippopotamus and pygmy elephant disappeared (figure 4.1).⁴³

Megafauna extinctions, in relation to *Homo sapiens* arrival



After Elin Whitney Smith, based on Martin P. S. (1989). "Prehistoric overkill: A global model." In *Quaternary Extinctions: A Prehistoric Revolution* (ed. P.S. Martin and R.G. Klein). Tucson, AZ: Univ. Arizona Press. pp. 354–404.

Figure 4.1: Megafauna extinctions by continent.

With such overwhelming evidence, it's not hard to see why this overkill has been called "one of the swiftest and most profound biological catastrophes in the history of the earth." But why exactly did this happen? One clue is that Africa (and, to a limited extent, Asia) is the only continent where megafauna still exist plentifully. In these areas, hominids evolved alongside the megafauna, so the animals had millions of years to evolve an instinctive fear of humans. However, by the time of the exodus from Africa, the new capabilities arising from the patterning instinct were already fully developed, causing a precipitous imbalance in the ecological equilibrium that had previously existed. Our ancestors used strategy and advanced weapons on creatures that had never come across humans before and, therefore, had never evolved any reason to fear them.⁴⁴

Most likely, the herbivores were hunted down by humans, while the predators died out after their natural prey disappeared. While the overkill looks

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yoga posture (figure 6.1). A number of observers have interpreted this to suggest that Harappan civilization may have been a source of India's unique spiritual tradition. If this linkage is indeed valid, writes scholar Eknath Easwaran, "it would imply that the same systematic attitude the Indus Valley dwellers applied to their technology was applied also to study of the mind." It is intriguing to consider the possibility that this vanished civilization might have formed the basis for a practice that continues to influence millions of people throughout the modern world.⁴⁷



Figure 6.1: Harappan seal showing a seated yoga posture

For reasons not entirely clear but probably related to climate change, Harappan civilization began declining around 1800 BCE. Their decline was likely exacerbated by an invasion from the north of a group of illiterate, horse-

Since the early Aryans had no writing, the *Rig Veda* was originally transmitted orally across the generations until it was written down hundreds of years later.⁵³

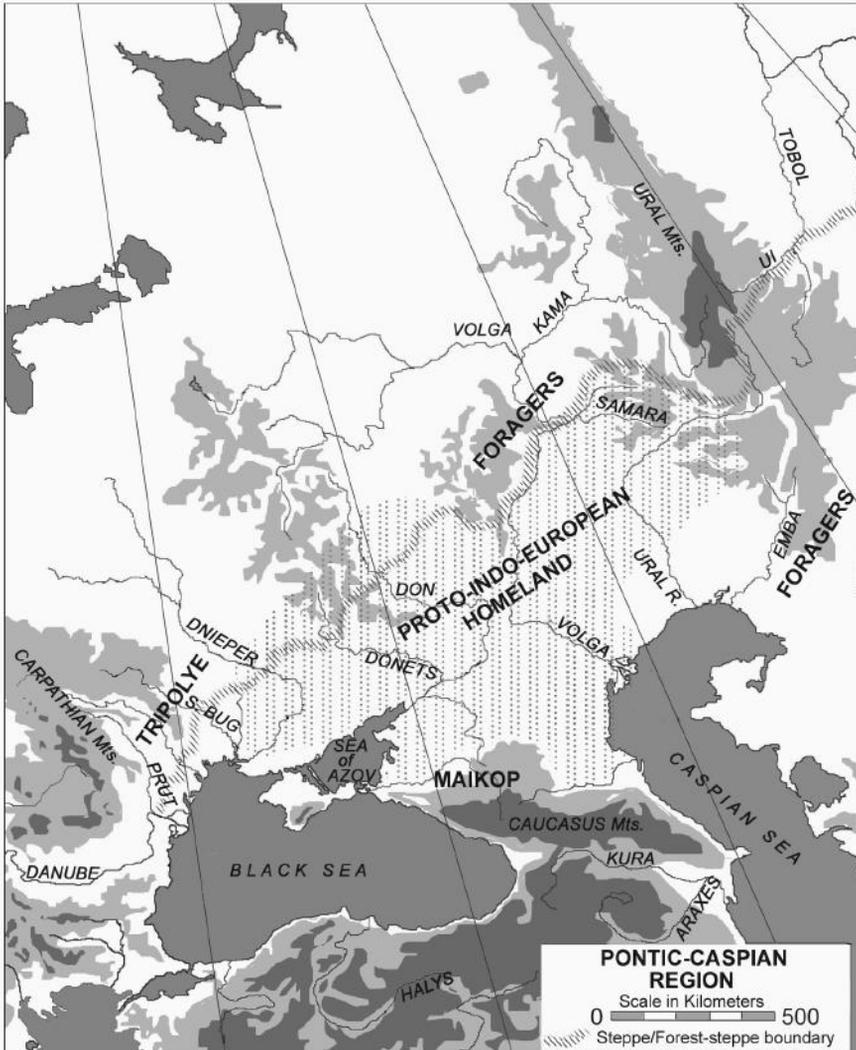


Figure 6.2: The PIE homeland according to the Kurgan hypothesis

The *Rig Veda* is clearly the work of an invading people. Two of its early books refer to places in eastern Iran and Afghanistan on a direct path from the Black Sea to the Harappan cities. Another book recounts the feats of two clans

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a vibrant, multicultural zone, a result of the unusual cultural tolerance of the massive Persian Empire, which stretched from Libya in the west to the Indus river valley in the east. (See figure 7.1.) The Greeks seem to have taken advantage of this tolerant environment, with merchants, mercenaries, and artists traveling widely, absorbing different cultural influences and bringing them back to their own city-states. Arising from this cultural *mélange*, the “Greek miracle” was really a marvel of convergence and emergence: a convergence of multiple worldviews, leading to the emergence of a synthesis of these views as a new, comprehensive system of thought.⁵

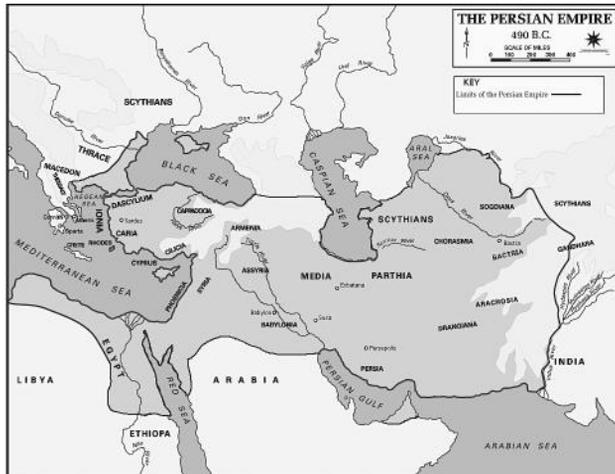


Figure 7.1: The extent of the Persian Empire around 500 BCE

It's only in recent decades that the extent of Greek indebtedness to other Near Eastern civilizations has been fully acknowledged. In 1992, Walter Burkert published an important work, *The Orientalizing Revolution*, which demonstrated how extensively the ideas of the Greeks had been influenced by eastern models. The Greeks themselves might not have argued with Burkert. Their own historian, Herodotus, described how Pythagoras had traveled to Egypt, where he was captured and taken to Babylon, as a result of which he learned both the Egyptian and Babylonian approaches to mathematics. Even the Greek alphabet, from which all Western alphabets evolved, was derived from that of the Phoenicians, who had themselves taken it from other Semitic sources.⁶

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Yin and *yang*, however, are not antagonistic to each other, and one is not considered better than the other. The *yin-yang* relationship is based, rather, on mutual harmony. A useful way of thinking about it is to consider the positive and negative poles of an electric current, or the relationship between the north and south poles of the earth. Each is a necessary part of an integrated system, and neither can exist without the other. This complementarity is summed up beautifully in the *Tao Te Ching*:

The difficult and easy complement each other,
 The long and short shape each other,
 The high and low lean on each other,
 Voices and instruments harmonize with one another,
 The front and rear follow upon each other.¹⁰

When *yin* and *yang* are applied to the perpetually moving patterns of *qi*, they form the dynamic cycles that are ubiquitous throughout the natural world: the waxing and waning of the moon; the cresting and falling of a wave; the rhythms of day and night, of summer and winter, growth and decline, birth and death. A profound insight of this system is that each pole of the cycle always contains the other within it. *Yin* is always becoming *yang*, while *yang* is always becoming *yin*. The famous *yin-yang* sign (figure 9.1) exhibits this, showing each side containing a seed of the other.¹¹



Figure 9.1: The classic Chinese symbol of yin and yang.

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we're in to rattle because the plane engine's sound waves resonate with the glass. Similarly, we can imagine the myriad movements of *yin* and *yang* throughout the cosmos as a form of wave action, only this time, the waves are the dynamic action of the entire universe.¹⁵

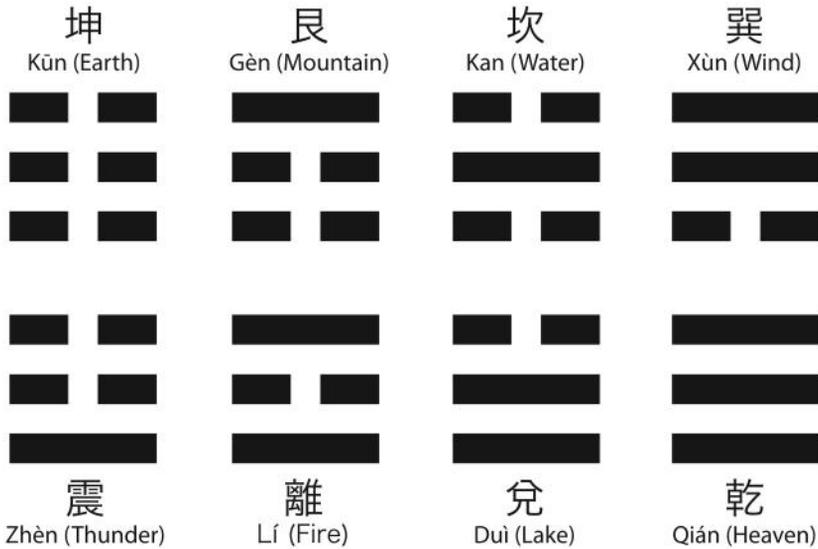


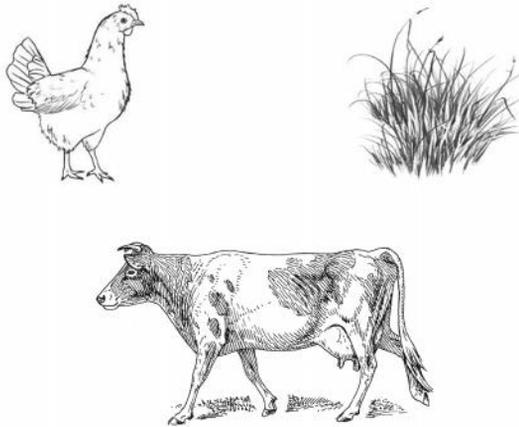
Figure 9.2: Examples of *I Ching* hexagrams

This notion of a universe working through resonance led to an altogether different understanding of cosmic order than the one developing contemporaneously in Greece. Plato visualized his god as the personification of reason, constructing the universe out of primordial chaos on geometric principles. In the Chinese world, by contrast, as described by renowned scholar of Chinese science Joseph Needham, “the harmonious cooperation of all beings arose, not from the orders of a superior authority external to themselves, but from the fact that they were all parts in a hierarchy of wholes forming a cosmic pattern, and what they obeyed were the internal dictates of their own natures.”¹⁶

The sense of intrinsic cosmic harmony extended to the dynamics of human society as well as the great forces of nature. As an ancient commentator on the *I Ching*, Wangbi, observed: “We do not see Heaven command the four seasons, and yet they never swerve from their course. So also we do not see the sage ordering the people about, and yet they obey and spontaneously serve him.”¹⁷

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say which two went together. American children, focusing on categorizing rules, pointed to the chicken and cow, explaining that “both are animals.” Chinese children, emphasizing relationships, put the cow and the grass together, pointing out that “the cow eats the grass.”⁵²



Based on Richard E. Nisbett, *The Geography of Thought: How Asians and Westerners Think Differently... And Why*. (New York: Free Press, 2004).

Figure 10.1: “Which two go together?”

Following in the footsteps of their ancient forebears, East Asian and Western people continue to construct their sense of self in different ways. Social psychologists have observed that the East Asian concept of self is more interdependent, emphasizing fitting in and attending to the needs of others. The Western sense of self, seen in its most extreme form in American culture, emphasizes independence, attending more to the need for self-actualization through expression of a person’s unique attributes.⁵³

These contrasting construals of self lead to different pathways for achieving well-being. It is generally assumed in the West that people have a need for positive self-regard, a view so widely accepted that it is frequently believed to be a fundamental requirement of mental health for people everywhere. However, tests have shown that Japanese people, for example, tend to be more comfortable in a context of self-criticism and need for improvement than one of high self-esteem. Researchers see the Japanese comfort with self-criticism arising from a sense of self defined by relation to the community: the self-critical tendencies reflect a commitment to fitting in as much as possible to the social unit.⁵⁴

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pher who put their insights together to form an explanation of the universe that would not only refute the Buddhist view of emptiness but provide a basis for the Chinese understanding of the cosmos for centuries to come. His name was Zhu Xi, and what he accomplished was an extraordinary act of synthesis and transformation. He took Zhou Dun-yi's interpretation of the Supreme Ultimate, Zhang Zai's understanding of *qi*, and Cheng Yi's view of the central role of *li*, and he wove these elements together into one coherent system.¹⁶

Major Neo-Confucian Philosophers

Philosopher	Dates	Key Contribution(s)
Zhou Dun-yi	1017-1073	Equated <i>tai-ji</i> ("Supreme Ultimate") with <i>wu-ji</i> ("unlimited"). Wrote Diagram of the Supreme Ultimate.
Zhang Zai	1020-1077	Saw <i>qi</i> as the fundamental substance of the universe. First identified <i>li</i> in terms of "the one and the many." Wrote the Western Inscription.
Cheng Hao	1032-1085	Believed in studying the heart/mind to understand <i>li</i> .
Cheng Yi	1033-1107	Recognized that <i>li</i> applied to everything in the universe. First described the fractal nature of the <i>li</i> .
Zhu Xi	1130-1200	Described the universe as comprised of both <i>qi</i> and <i>li</i> interacting with each. Systematized the Neo-Confucian approach to the cosmos.
Wang Yang-Ming	1472-1529	Emphasized <i>liang zhi</i> ("intuitive knowledge"). Believed in the "democratization of sagehood."

Figure 14.1: Major Neo-Confucian Philosophers

The Organizing Principles of the Universe: *Qi* and *Li*

Zhu Xi described the universe as being fundamentally composed of both *qi* and *li*. *Qi* was the term for all the energy and matter in the entire universe, and *li* was the term for how that energy and matter was organized. The interplay of *qi* and *li* determined every aspect of reality. "Throughout the universe," declared Zhu Xi, "there is no *qi* without *li*, nor *li* without *qi*." One cannot exist without the other because each can only be defined in terms of the other, in much the same way that a rectangle cannot exist without both width and length. The

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way, it does so not by repressing or overriding emotional states but by integrating them into appropriate decisions and actions. Additionally, cognitive scientists increasingly recognize that cognition takes place not just in the brain but in the felt sensation of the entire body.⁵⁰

Key Neo-Confucian Terms

Term	Meaning
Cheng	Integrity, authenticity, sincerity: the integrated cohesion of any natural living system.
Dao/Tao	The tangible manifestation of the universe in the ever-changing interactions between li and qi that comprise the cosmos.
Ge wu	“Investigation of things”: the embodied practice of understanding li in the universe and within one’s own nature.
Li	The principles of the universe that organize the qi in dynamic patterns of cohesion.
Liang zhi	Innate or intuitive knowledge: the embodied capacity for moral discernment which does not depend on reflective thinking.
Qi	The entire substance of the universe, comprising energy and matter in all its forms.
Ren	The sense of love arising out of an embodied realization of one’s intrinsic connectedness with all other beings in the universe.
Xin	The heart-mind: locus of feeling, intellect, intuition, and reason.

Figure 14.2: Key Neo-Confucian Terms

Based on this framework, the Neo-Confucians recognized that the spiritual goal of a human being was not to transcend their natural emotions but to harmonize their emotions with the Tao in their own nature and the world around them. When a person felt no stirrings of emotion, her psyche was said to be in equilibrium. When an emotion such as pleasure, anger, sorrow, or joy arose, this shifted the equilibrium to a state of harmony, which was “the universal path which all should pursue.” Harmony, in this case, was understood to emerge when the emotions were expressed coherently, without contradiction.⁵¹

A Neo-Confucian philosopher, Wang Yang-ming, who lived several centuries after Zhu Xi, developed further this idea of harmonizing one’s emotions. Wang emphasized that harmony arose from the appropriate expression of all

artificial life: For what is the heart, but a spring; and the nerves, but so many strings; and the joints, but so many wheels, giving motion to the whole body, such as was intended by the artificer?²⁰



Figure 15.1: Thirteenth-century illustration showing God as architect of the universe.



Figure 15.2: “Buddhist Temple in the Hills After Rain” by Li Cheng



Figure 15.3: “Mona Lisa” by Leonardo da Vinci

European Cycle of Domination

Even with this reverence toward nature, China has experienced a long history of environmental degradation. The construction of the Great Wall, for example, resulted in vast deforestation, which caused greater sediment loads in the Yellow River, leading to massive flooding that displaced two-thirds of the local population. In our modern era, as the world faces a slew of environmental crises potentially threatening the long-term sustainability of our civilization, we must ask how to interpret this mismatch of the underlying metaphor of nature and the testament of history. Does the Chinese experience imply that, regardless of how humans approach the natural world, we are doomed to mismanage it anyway? Does it indicate that the traditional Chinese approach to the natural world was not as harmonious as its art and philosophical writings suggest?⁴³

A clue to this conundrum may be found in the experience of our hunter-

His 1983 book *The Fractal Geometry of Nature* had a profound effect on the field of mathematics. Mandelbrot explained in clear terms the limitations of classical theory:

Most of nature is very, very complicated. How could one describe a cloud? A cloud is not a sphere. . . . It is like a ball but very irregular. A mountain? A mountain is not a cone. . . . If you want to speak of clouds, of mountains, of rivers, of lightning, the geometric language of school is inadequate.

The fractal forms that Mandelbrot's mathematical formulas create have a delicate grace that mirrors the beauty of nature itself (figure 19.1). Fractal geometry helped instigate a deeper understanding of patterns in nature. One profound insight was that the same design tends to repeat itself at larger or smaller scales. Coastlines, cloudscapes, sand dunes, and rivers all demonstrate what is known as scale independency, creating similar patterns both close up and from a distance. Biologists began to recognize these fractal patterns in all kinds of living systems: leaf veins, tree branches, blood vessels, lung brachia, and neurons. Social scientists discovered similar fractal principles in all kinds of human constructions: cities, music, and stock market fluctuations.



Figure 19.1: Computer-generated fractal image of a fern

The enormous range of domains in which fractals could be identified led to an even more profound realization: there seemed to be certain principles in nature itself that applied across a whole array of disciplines. The traditional approach to science, in which specialists focused their lives on one tiny patch of knowledge, seemed incapable of recognizing these cross-disciplinary underlying structures in the nature of reality.²¹

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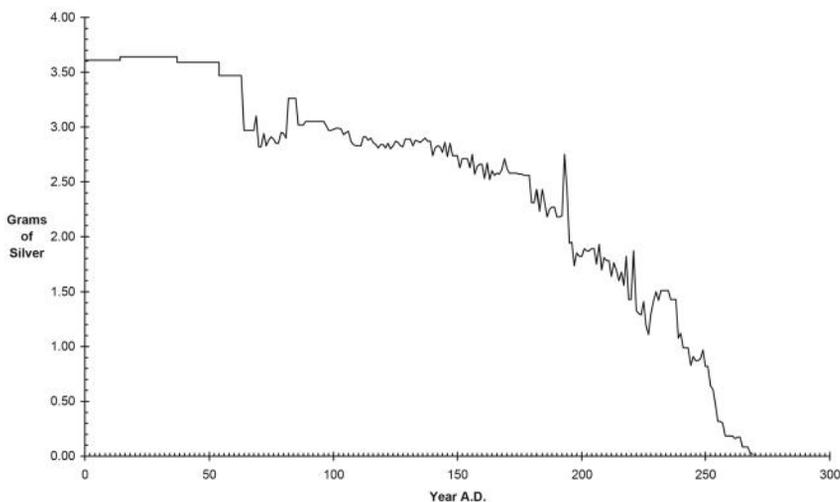


Figure 21.1: Debasement of the denarius to 269 CE (Tainter 1988).

A modern version of this process has occurred in the overexploitation of fisheries, where stocks decline as a result of being overfished from one generation to the next, but people forget how things used to be and consider the situation to be normal, until the next decline. The term “shifting baseline syndrome” has been coined to describe how people get used to each new level. This, perhaps, offers an answer to Jared Diamond’s question of what that Easter Islander was thinking when he cut down the last tree. Most likely, he didn’t think anything of it at all because, by then, the only trees left would have been little more than weeds, good for nothing more than weaving a mat.²²

Will Our Society Collapse Like Rome?

It’s difficult to consider the collapse of the Roman Empire without drawing parallels to our own civilization. Whereas Rome’s primary energy source was conquered nations, the primary energy source of our civilization is fossil fuels. But we’re facing the same type of problems the Romans faced. Whereas they encountered increasing costs of administering their empire, we’re confronted with the global impact of rising carbon emissions. Where they chose short-term solutions that created insurmountable problems for future generations, we’re doing the same by permitting carbon emissions to keep increasing, even