

***Guiding
Our
Evolution***

If we don't do
it, who will?

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1. Introduction

What do you think is the most significant discovery that humans have ever made? Was it the fact that the Earth is round or that it moved around the Sun? How about the greatest invention? Was it the wheel? the printing press? the computer?

The greatest discovery thus far is how we human beings evolved over millions of years to be the way we are. The greatest invention will be ourselves – the next generation human being.



This book is about the past, the present, and the future. We ask where humans came from and who we have become. We reflect on where we might go and on the decisions we face in doing so. We ask these questions at a crucial moment in human history.

Ours is a time of wonder and excitement. We live in a time when the possibilities of our lifetimes are beyond our parents' dreams. But these possibilities are not all positive. We've learned that our actions can cause great harm. More than ever before, the choices we make today will either open or close the future of humanity. It's up to us!

2. Why worry?

This is the most heinous of crimes
This is the deadliest of sins
The greatest violation of all times
Mother of us all
Place of our birth
We are all witness to the rape of the world

Tracy Chapman

The sky is falling

Chicken Little

Every day we hear someone say that actions proposed by governments and businesses will cause harm. We hear that the environment will be damaged or that the economy will suffer. We're told that freedoms are in jeopardy or that morality has collapsed. Every now and then someone will even claim that the world is about to end.

How many times have we heard such warnings, then found things to be okay? It seems that fear of the unknown continually drives some of us to see doom just over the horizon. We look at a new development, like a new technology or a proposed change in governmental policy, and we imagine the worst outcomes to which it might lead. Then when those outcomes don't happen we do the same thing when the next one comes along.

So why should we pay any attention to those who claim that today's social and environmental problems are critical? When so many predictions of doom have proven false, some even silly, why should we listen? Why should we worry?

We should worry because we're starting to *get* it and what we *get* tells us that the world is in trouble and it's our fault. We've made huge leaps in our understanding of how the world works. That understanding reveals clear signs that the paths we are taking are leading to social and environmental problems on a scale greater than at any previous time in history. We now understand why other doomsday predictions didn't come true, but, at the same time, we understand why it is almost inevitable that we will run into the hazards ahead if we don't change course.

Sure, we can debate about the severity and timetable of global warming. We can claim that ice melting at the poles is part of a natural cycle. We can frown at the danger of nanotechnology replicating itself and wiping out all other life. But there are fundamental changes happening on the planet that cannot be disputed. The human population is growing exponentially and much faster than we can increase our food supply. Plant and animal species are disappearing forever at an enormous rate, primarily because our actions have changed their habitats faster than they can adapt. These are facts that we cannot escape from. We need to worry because our world is threatened and our actions—what each and every one of us does or does not do on a daily basis—are to blame.

Consequently, we face some hard choices. We can bet that future developments in science and technology will solve our problems before it's too late—they've done it before. We can leave things to the "experts" in government, business and industry—that's what they're paid for. We can plead ignorance and carry on as if there were nothing to fear— isn't life tough enough already? But our developments in science and technology have leapt past the social and ethical developments necessary to control them. Our "experts" have proven themselves ignorant of consequences outside the domains of their expertise. And we cannot pretend that the forces we've set in motion will stop themselves if we look

away. Instead, our only reasonable choice is to take charge—to change the directions we’re heading through individual and collective action.

This book is about how we can make these changes and how we can create a future that we desire. We’ll look at how we humans came to be the way we are, where present paths are taking us, what forces seem to be at work, and how and where we can make a difference. We’ll try to do this by responding to a series of simple, yet powerful questions. The first is “Why worry?” or perhaps “What’s in it for me?” The answer is that this is a critical time in history. Now more than ever before, the understandings we’ve acquired and the power we’ve gained to influence global events place the future of our species and our world squarely on our shoulders.

Here is another way to put it. We’re facing a new reality, one of massive societal changes that touch the lives of every individual, community, and nation. This new reality raises questions: Are we only spectators of these changes? Are we destined to be their victims? Do we have to leave decisions affecting our lives to others? Are we at the mercy of "social engineers" and politicians who design systems and laws for us? The answer we will develop in this book is a resounding NO.

To get started, here are the two basic concepts we will work with: evolutionary consciousness and conscious evolution.

Evolutionary consciousness – knowing about change

Whether we choose to believe in a creator or not, we have to accept the fact that we are not today what we once were. There is abundant evidence and wide agreement that the human species has evolved over time, both biologically and culturally. Our bones and posture are different than they were millions of years ago. The ways we relate and communicate with one another and the things

we do are different as well.

Until recently, this evolutionary process was very slow. Migration and climate changes resulted in physical adaptation (changes in our bodies) and influenced how we behaved. New materials and tools were introduced that changed how food was gathered or cultivated. But these changes happened over thousands, even millions of years. Not so anymore.

In the past few centuries there has been an enormous shift in the speed and nature of change. For example, because of recent advances in medicine we are physically larger and live longer than ever before, and this has happened over decades rather than thousands of years. In fact, the forces driving change have now become cultural rather than biological. We're changing the nature of our species by how we choose to live, more so than by any process of biological adaptation or selection. We're even asking the question whether life is purely biological. For example, could a human consciousness take non-human form and reside in a machine?

There are several key concepts that are important to understanding evolution. We'll introduce two here. First is the fact that *everything relates*. We are part of a large whole, and change in any part affects others. For example, a drought in one area of the world, an earthquake in another, a shift in the jet stream over North America, a warming of an undersea current in the Pacific Ocean, a decision to drain some of Lake Superior to raise the water level elsewhere, a set of dams backing up a river so that power can be generated. These are all related. As are the motions of the sun, earth and moon. As are the actions we take on a daily basis and their consequences for each other and our environment.

When we choose to farm in a particular way and to plant certain crops we change the soil, which changes the quality of the

water running through, which changes the content of the stream into which the water flows, which changes the life the stream can support. Choosing what to plant also changes what products will be available at market at what price, which influences what and how much consumers will purchase, which influences what forecasters see as economic trends, which influences investment and the interest rate on the loan to buy the seeds in the first place.

When we drive a gasoline-powered automobile we support an industry based on the extraction of a non-renewable energy source, we change the quality of the air, which effects our own health and that of the oxygen-producing plants we rely upon. When we take a drug we alter the chemical balance of our body, which influences how we think and act, which changes how we relate to others. When we pay attention to the speed limit or when we smoke a cigarette. When we recycle a bottle or when we make fun of someone just because he or she is different. Everything has an effect on something else, which has an effect on something else, and so on.

We can capture and better understand these sorts of interrelationships by identifying *systems*. We can speak of ecosystems to understand relationships in an environment. We can organize our bones into a skeletal system and our brain and nerves into a nervous system. We can say that certain parts of a car are in the fuel system while others are parts of the electrical system. We can even refer to the base-ten method of counting as a number system.

This can be very useful. For example, seeing how things relate as parts of systems can help us troubleshoot problems. But it's important to realize that what we call a system depends on how we look at it and why we do the looking. For a restaurant owner, a car can be a way to deliver pizzas (part of a transportation system). To a car dealer or gas station owner it is a source of income (part

of an economic system). To police it represents a way to patrol a community and respond quickly to reports (part of a security system, relying on a communication system). We are the ones who make systems by calling them systems. And when we do so, we risk missing relationships that don't seem important to the purpose we have in mind. For example, we may think we can improve a system by making a change in a part, only to find out afterward that the part we changed had an important role elsewhere.

This is understandable since we can't see all connections and we can't keep everything in mind at once. The important point to remember is that as hard as we try, and as good as our understanding gets, our actions will still often have consequences beyond what we imagine. Everything relates.

A second concept that is important to understanding evolution is *diversity*. Yes, we know. You hear the term diversity thrown about all the time. Our companies are supposed to seek diversity in hiring employees. Our schools are supposed to support diversity of ideas. People setting aside money for the future are told that it's important to diversify their investments.

But why is diversity so important? It's not just political correctness. It turns out that both natural systems like ecosystems, and human-made systems like communities and organizations, depend on diversity to survive and develop. Following what is called the *law of requisite variety*, a system can adapt to change only when it has enough variety in its parts. If all the parts are the same—if they look the same and do the same things—then adapting to a change in the environment would require every single part to change at the same time. That's impossible. And the environment is constantly changing! So a business trying to diversify its workforce, or a school looking to diversify its faculty or student body, may be responding to political pressure. But in the long run this same action proves essential to its survival.

We are describing these principles because many of our actions over the past decades, whether they were individual habits, business practices, or governmental policies, violate them! We take actions that ignore the interdependent nature of the world. As a result, our actions have unexpected and, in many cases, dangerous consequences. We reduce rather than encourage diversity. For example, we allow the consolidation of power and wealth on a global scale and, therefore, reduce the ability of social and economic systems to adapt and survive. By gaining great influence and seeing the profound consequences of our actions, we have found out how little we understood about the world as we took these actions in the past. Now we understand them and have the opportunity to change.

Conscious evolution — changing on purpose

Evolutionary consciousness means that we understand how things change by evolutionary processes. Conscious evolution means that we use this understanding to purposely direct how change occurs. We seem to be on the brink of doing this biologically. For example, we've gained the ability to make identical copies of animals by cloning, and we're learning how to grow replacement parts for humans in other animals. If we choose to support their development, changes that "improve" the human species will be with us soon. We face serious ethical issues here.

On the other hand, we already have the ability to do this culturally. We make choices that determine how we and others live. We choose certain relationships. We choose the form of the communities we live in. We create laws and bodies to enforce them. We choose certain political and economic structures over others. We create nations and boundaries. We develop technologies to serve human purposes. And so on. Not every action has significant consequences, and not everyone has the same influence. But as a species we have much ability to change the

conditions in which we live. We now evolve by choice, and this has become a more powerful force for change than biology.

Our understanding of evolution combined with our ability to influence its direction gives us great responsibility. We now know that the future is up to us, and we can no longer pretend ignorance in taking or not taking actions. Consequently, this is a critical time in human history. History is full of examples of the resilience (ability to bounce back) of humans and the earth. All the signs indicate that such resilience now depends on us—on informed human action.

So, should we worry? Yes we should. Is worrying enough? Certainly not. We need to develop evolutionary consciousness, then use this to consciously evolve. The next two chapters are about evolutionary consciousness. Then Chapters 5 and 6 are about conscious evolution. To get started, we ask “How did we get here?”

Core Ideas of Chapter 2

2.1 We have gained an understanding of evolutionary processes.

We now know a lot about how we came to be the way we are.

2.2 We also know that change was gradual over many thousands of years but recently has accelerated. The major evolutionary forces have shifted from biological to cultural.

2.3 A key understanding is that everything relates. We are part of a large whole. Seeing things as interdependent parts of wholes is important. For example, it shows us how actions in one area have consequences elsewhere.

2.4 We have also come to understand that further development depends on diversity.

2.5 We have gained great influence on our world and realize that we are causing harm. Our actions have caused environmental and social crises so large that our survival is in question.

2.6 Combined, our understanding and influence give us great

responsibility—we now know that the future is up to us, and we can no longer pretend ignorance in taking or not taking actions. 2.7 Consequently, this is a critical time in human history when important choices need to be made.

Activities

Throughout the book we will suggest simple activities that will enrich your understanding of the concepts and principles we describe. We'll try to make them simple, short, and fun, so we hope you will give them a try. Here are a couple to get started.

A. Think of anything that happened to you in the last week. Ask yourself what could have caused it to occur. Then ask what caused those causes. Then ask what caused the causes of the causes. Everything relates?

B. Pick up a newspaper and read any article about a governmental body making some sort of decision. Ask yourself what would happen if everyone in that body held the same opinions on all issues. Is diversity necessary? Why?

3. Where did we come from?

The time's they are a changing

Bob Dylan

Toto, I've a feeling we're not in Kansas anymore

Dorothy

Who are we? Why are we here? Where did we come from? These sorts of questions have likely been on our minds ever since our species gained consciousness. The answer seems to depend on whom you ask. Philosophers and early scientists up to the end of the 18th century could only speculate. For example, they imagined that the universe as a whole followed the life cycles they saw in themselves and their environment. It was born, it grew, and it would eventually die. Thinking positively, it would be followed by another world that was more complex and more perfect. Other people who did not interpret the Bible literally added the possibility that animals that lived in the sea evolved to live on the land.

In the 19th and early 20th centuries scientists such as Alfred Russell Wallace and Charles Darwin took this evolutionary possibility as a starting point. From their observations of the world, Wallace and Darwin guessed that plants and animals evolved through a process called *natural selection*. They saw that plants and animals around the world had somehow adapted themselves to a remarkable range of environments, and suggested that this could have happened by a gradual process in which slight variations were inherited by the next generations. For example, a particular characteristic might help a plant grow better in a certain climate, and as a result this characteristic would be favored and passed along to the next generations. It would be naturally selected over

other characteristics that were not as useful.

In the 20th century, scientists developed a far richer understanding of evolutionary processes. They used new techniques and technologies and were able to develop a clearer picture of how our world and our species evolved. For example, they discovered and carefully examined campsite remains, tools, footprints, and DNA evidence to learn how early humans looked and acted. Work by scientists such as archeologists and paleontologists continues to give us insights on where we came from.

This chapter is about what these scientists have learned, but before getting to that, it's important to notice that our question asks about us: Where did WE come from? We're focusing on the evolution of our species rather than evolution in general. If we were to look at evolution in general, we'd need to go back fifteen billion years to the formation of matter, twelve billion years to the formation of the Milky Way galaxy, five billion years to the stabilization of the physical and chemical structure of the earth, and three and a half billion years to the origin of life on earth.

We're picking up the story very late—only 5-7 million years ago when our species split off from the ape family to become human. This is one of three main evolutionary events we'll describe, the others being the emergence of *Homo Sapiens Sapiens* or “modern human” about 35,000 years ago, and the recent revolution that we will call conscious evolution.

Our early ancestors

Most scientists portray human evolution as a tree, with branches from the trunk representing the development of different species. Branches that end quickly represent variations that did not survive. Branches that grow and split represent species that

continued to adapt and survive. This splitting might be caused by a species being isolated from others and thus developing in a different way, or by some sort of unique adaptation, for example, upright walking.

Starting from the tree trunk and moving upward (forward in time), the first major branching occurred about five to seven million years ago. The humanoid species called *Australopithecus Afarensis* split off from the chimpanzees and began to walk on two legs as a habit and to live on the ground rather than in the trees. We do not yet have fossil evidence for the first few millions of years following this split, so we'll have to skip ahead.

Recently, scientists have found fossil evidence that over four million years ago, our ancestors were indeed walking on two legs. The climate had changed making trees more sparse, so *Australopithecus Afarensis* had moved from the trees of the forest to the open savanna. Scientists believe that humanoids made the adaptation to stand on two legs because this made it easier to look over the grass, to carry food and infants during their first years, and to use tools. More importantly, this adaptation demonstrated versatility, or the ability of our ancestors to adapt to changes in their environment.

The next of our ancestors were *Homo Habilis*, appearing around 2.5 million years ago and disappearing close to a million years ago, and *Homo Erectus*, appearing around 1.7 million years ago and disappearing around a half million years ago. Notice the overlap, which is typical of evolutionary processes. *Habilis* and *Erectus* lived on the earth at the same time for over half a million years!

Homo Habilis may have been the first humanoid to use tools, for example, stone hammers. Their brains were larger than *Australopithecus Afarensis*, they lived in campsites and in kinship

groups, and they cooperated with each other, for example, to nurture and protect their children.

Homo Erectus was larger than Habilis. In fact, Homo Erectus was larger and stronger than modern humans. They could travel long distances across the savanna, and they were the first humanoid species to move beyond Africa. Evidence of Erectus has been found as far apart as Great Britain and China. Living in an ice age, Erectus constructed shelters, made clothing, and harnessed fire. They scavenged food over wide ranges from temporary homebases, they created tools that followed standard patterns, and they cooked in pots. Their brains were again larger, and their larynx (voice box) was halfway between where it is in apes and modern humans. This suggests that they may have developed some form of human-like speech. Erectus thus represents a clear transition between an ape-like past and a human-like future.

The species that followed Erectus are, therefore, considered more human. The first of these, called *Archaic Sapiens*, is our direct ancestor. Archaic Sapiens emerged about 200,000 years ago, began to migrate from southern Africa to Europe, Asia, and the Americas about 100,000 years ago, then evolved into the modern human (us) about 35,000 years ago. Archaic Sapiens developed what might be seen as an early form of consciousness, a sense of how they were separate from the rest of the world. They communicated with one another through complex signs, and might have acted on thoughts that went beyond instinct and habit. They established home bases where infants could be nurtured, food could be shared, the sick could rest, and so on. They likely did some hunting but relied primarily on scavenging. They made a variety of tools, and they were the first to prepare raw materials from which other products could be made.

A second descendent of Erectus, not our direct ancestor because of differing DNA, is called *Homo Sapiens Neanderthal* or

simply Neanderthal. The Neanderthals are the basis for most of our images of “cavemen.” They lived in caves and open-air shelters in Europe and Asia during an ice age. They developed very strong bones and muscles to survive in these inhospitable areas, and bulbous noses to warm incoming air. They lacked the high rounded foreheads, prominent chins, and other physical features of Archaic Sapiens, and rather than in kinship groups like the Archaic Sapiens, they lived in relative isolation from one another. Surprisingly, they had larger brains than modern humans, but it’s unclear to what use these were put. Neanderthal failed to change over thousands of years and, as a result, became extinct about 35,000 years ago. Notice how these two things happened at the same time. The Archaic Sapiens and Neanderthal lived together on the earth for 65,000 years, but then as Archaic Sapiens evolved into modern humans, the Neanderthal disappeared. One species adapted and survived while the other did not.

Modern Humans – The First Generation

The first and most famous of our modern human ancestors is the *Cro-Magnon*, whose intellectual, social, and technological development was truly remarkable. While earlier species adapted biologically over millions of years, the Cro-Magnon triggered the cultural developments that we see in our lives today in just thousands of years. They had brains identical in size to our own and developed sophisticated speech symbols and language. They cooperated with each other in kinship groups, and they traded between tribes. They developed a wide variety of sophisticated tools and other technologies—everything from fish hooks and sewing needles to lamps and ceramics. They established story telling traditions, worshiped multiple gods with rituals and ceremonies, and created beautiful paintings, sculpture, and musical instruments. Most importantly, these developments suggest that the Cro-Magnon had developed the ability to step back and observe themselves. They had developed the level of consciousness we think of today when we say “human.” So, 35,000 years ago while

the Neanderthal failed to adapt and disappeared, the Archaic Sapiens transformed into Cro-Magnon—into modern human.

The Second Generation

The Cro-Magnon represents the first of four generations of modern humans. The second generation started about 10,000-12,000 years ago with the beginning of the agricultural revolution. Helped by a warming climate, we learned to cultivate the land and produce food in nearby permanent homes, perhaps in agricultural villages, rather than to continually travel to hunt and gather. We created farming tools like plows and scythes, and clay vessels to store food after the harvest. We learned to domesticate animals to ease our burdens and to have a steady supply of meat. And we developed more sophisticated languages with which to plan our farming for the coming year.

We maintained this basic farming way of life for 6,000-7,000 years, but with improvements in technology, our small villages were able to produce more food than they needed. This meant that they could trade food for other goods produced by people engaged in things other than farming. Thus the rise of occupations such as merchants, traders, and artisans, and the gathering of people in high-density settlements. Think about this for a moment. The simple act of producing more food than needed was a major factor in the rise of cities and major civilizations. (Because the majority of people remained living in small farming villages, and it was these villages that made life in the cities possible, we'll talk about the rise of the cities as part of the same generation.)

Gathering in high-density settlements led to interconnections between, and early civilizations emerged in Mesopotamia, Egypt, India, China, Mexico, and South America. Each of these civilizations developed a set of interconnected cities that served as centers of culture and trade. They developed their own forms of writing, mathematics, and astronomy, and their own

communication networks, specialized classes of occupations, and armies. Economics became a powerful force and each civilization created its own type of money to exchange for food and other goods. And the development of writing made it possible to run economies, formalize education, and pass information to those living at a distance (in both space and time). It was in these early civilizations that governments and planning tools like calendars were created, and where metallurgy was developed to make tools and ornaments first from copper, then silver and gold, and then iron. The main effect of all these was the establishment of private ownership of the land and goods and, concurrently, the need to protect and defend one's property. It brought fourth a way of life and a view of the world that was very different from the agricultural village life and the tribal life of the Cro-Magnons.

Combinations of iron-age technology, invasions, and internal decay and corruption brought each of the ancient civilizations to an end. In their place new civilizations arose in Greece, Rome, Persia, India, and China, and these new civilizations brought about significant developments in fields such as science, philosophy, art, and religion. For example, the Greek civilization from about 1,000BC to 700AD stands out for its classic architecture, its development of democracy and self-governance, and the works of philosophers such as Socrates, Plato, and Aristotle. Major religions were established during this period, including Judaism, Islam, Buddhism, Hinduism, Taoism, and Christianity, and this was the age of the Roman and Byzantine Empires. Again, these civilizations were to disappear as a result of invasions and civil wars.

The Third Generation

The third generation of modern humans might have begun 1,700-1,500 years ago, but the collapse of the Roman Empire led to a thousand-year period often called the *dark ages* in which new discoveries were denied and scientists making the new claims were

punished by church authorities. So a new generation was delayed until about five hundred years ago. Once it started, however, the transformation of the third generation was extraordinary.

A scientific revolution profoundly changed our understanding of the world. For example, second generation humans had no concept of the earth being round or circling the sun. They watched seasons go by and the weather change, but had no explanation for this other than “the will of God.” A very few could read and write symbols, but they had no means to readily share what they wrote with others. Until very recently humans had no idea how to use oil or electricity as an energy resource, there were no eyeglasses or engines, and flying was literally for the birds.

In the third generation much happened in a very short time. Scientific discoveries and other innovations led to a technological revolution, for example, to new tools, to energy sources other than human and animal, to machines, assembly lines, railroads, automobiles, and so on. These had the effect of vastly increasing agricultural productivity, so fewer people needed to farm and a majority left for the cities to work in new manufacturing and service industries. A communication revolution began with the invention of printing, and with the availability of books, more and more people learned to read and write. For the first time the Bible was available to people other than church authorities, and their authority was challenged as a result. Public education was born. The arts flourished in what was called the Renaissance (rebirth). Knowledge spread more widely and faster than ever before, and toward the end of this generation, electronics made near-instant worldwide communication possible.

These developments led people to see the world as something that behaved according to reason or natural laws that could be discovered and used to advantage. For example, rather than being

born to a certain life, an individual could use his ingenuity and drive to become something else. (We say “his” because women in this generation were generally not permitted—by men—to share in this.) The results were both good and bad. For example, they included great improvement in the living conditions for many people, longer lives because of advances in medicine, and the development of modern democracies, but at the same time, great emphasis on material gain, weaker connections with community and family, and unprecedented destruction of the natural world.

Evolutionary processes

So, what do these stories of our ancestors tell us? First, they tell us that there are three evolutionary processes:

- (1) physical evolution of our environment, for example, changes in the chemical and geological structure of the earth’s surface;
- (2) biological evolution of plants and animals, for example, the diversification of species, including humans; and
- (3) cultural evolution or change in how we humans live and relate to one another.

As we will describe below, physical evolution came before biological evolution, and biological evolution came before cultural evolution. All three continue to occur, but they do so at dramatic differences in speed. Biological evolution is much faster than physical evolution, and cultural evolution is much faster than biological evolution. As a result, cultural evolution has become the most significant evolutionary force.

This leads to the second thing that the stories of our ancestors tell us—that evolution is now very much affected by our choices. In fact, our choices don’t just cause changes in our culture. Because of scientific and technological advances, they also affect

physical and biological processes. But before we get to that, let's step back and look at physical and biological evolution in more detail.

Physical and biological evolution

By physical evolution we mean the evolution of matter, from a single atom to various elements to living beings. We may think of physical evolution as stable, but this is just the timeframe we apply. It took 15 billion years for our world to get to its present state, so most things change far slower than we notice in a human lifetime.

Physical evolution created the conditions in which biological evolution could begin. We won't go into detail here, but use these examples to think about how biological evolution has accelerated. Life in a biological sense began about 3.5 billion years ago. For the first billion years or more, lifeforms on earth were extremely simple, mostly just bacteria. Then somewhere around a billion years ago, soft-bodied marine animals like jellyfish developed, followed about 500 million years ago by the first animals with skeletons. Marine animals adapted to live on the land about 300 million years ago, and some grew to sizes far greater than we see today—the dinosaurs. Then in the past 200 million years, an enormous variety of plant and animal species have evolved, human beings only in the past 200,000 years. So, from bacteria developing over more than a billion years, we reach Homo Sapiens just 200,000 years ago, and modern humans only 35,000 years ago.

Over these billions of years there appear to be times when change is sudden. For example, the dinosaurs disappeared very quickly, and many scientists now agree that this happened because an asteroid hit the earth and the resulting cloud of dust changed the climate too rapidly for them to adapt. On a smaller scale, some species appear to have emerged suddenly, perhaps as a result of something going “wrong” in the development of offspring, but the

offspring succeeding enough in the environment to live and reproduce.

More typically a very gradual process of biological evolution is thought to occur, and the primary mechanism for this is natural selection. Natural selection works by adaptation to the environment and inheritance. The environment changes, a species relies more heavily on a particular characteristic in the changed environment, and this characteristic is passed along to the next generation. For example, the climate change that forced our ancestors out of the trees and onto the savanna led to our arms and legs being shaped to better support walking on two legs.

This is not to say that every adaptation is successful. It's more like trial and error. A species attempts to adapt to the environment and produces variations. Some variations succeed—they increase fitness—while others do not. When successive variations are unsuccessful and/or when the environment changes too quickly for the species to adapt, it disappears. The species becomes extinct. (Think Neanderthal.)

One result of natural selection is an increase in variety. Plants and animals in different environments adapt in different ways, therefore we find more and more diversity over time. As we said in Chapter 1, this diversity is desirable because it allows systems, or species in this case, a better chance to adapt to further changes in their environment.

Think about how these principles relate to one another. Adaptation and natural selection happen through small changes in characteristics. Species don't suddenly become something entirely different. Cats don't all of a sudden become dogs. The color of their hair, the shape of their ears, the size of their brains, and so on, all change very slowly in response to changes in the environment. So, natural selection leads to a cat that is better suited to the

surrounding environment. You may have heard natural selection referred to as *survival of the fittest*. Here we have the “fittest” cat.

This adaptation of characteristics leads to increased specialization of function, also. Certain characteristics serve different functions better, so over time they become more specialized to do so. Some examples include the color-changing ability of chameleons, the night vision of owls, and the incredible sense of smell possessed by sharks. These remarkable abilities developed to serve special functions in these animals’ environments. And as these examples suggest, specialization in function leads to greater differentiation in parts. The chameleon’s skin, the owl’s eyes, and the shark’s nostrils are special parts that serve special functions. So adaptation and natural selection lead to greater differentiation of parts—to diversity.

But all these parts can’t just do their own things. They have to work together. So, a greater number of parts leads to greater dependence on one another and, therefore, greater integration. (Remember that everything relates.) Greater differentiation plus greater integration means greater *complexity*, and this is the basic path of evolution—toward greater complexity. We’ll talk more about complexity later. The important point to remember is that evolution leads toward greater complexity, not toward simplicity.

Cultural evolution

Since the emergence of Archaic Sapiens we have been in a third phase of evolutionary processes, one dominated by cultural evolution. Recall that physical evolution referred to matter and our physical environment, and biological evolution referred to living things such as plants and animals. Cultural evolution refers to changes in how we humans live and learn, and to how we relate to one another.

The key distinction of cultural evolution is that changes are

not brought about by mindless processes but by conscious choice. Rather than wait for adaptation through natural selection and inherited traits, we adapt by design. For example, rather than wait for new body parts to extend our arms or keep us warm, we design a tool and make clothing. We rely on our own creativity and innovation rather than natural selection.

There are several important consequences of this shift to cultural evolution. First, changes are far faster than ever before. Rather than the many generations and millions of years of biological evolution, changes in culture happen within the space of single generations, recently even within single years. Second, changes are no longer just adaptations to changes in the environment. We change because we choose to change. Third, while natural selection produces diversity by the continual separation of species, and one species cannot reproduce with another, a culture can change dramatically through becoming interconnected with another. And fourth, while natural selection eliminates variations that are not useful in a local environment, cultures can retain and pass along innovations through writing and education.

Co-evolution

Notice how one type of evolutionary process made the next type possible. Physical evolution somehow reached a point where life was possible, and biological evolution reached a point where human consciousness and culture were possible. For example, the biological development of the human brain and the shaping of our vocal chords made it possible for spoken languages to develop, and thus the transmission of information across groups and the development of cultures. It's accurate to describe the processes as mutually influencing or *co-evolutionary*. This is especially clear here at the beginning of the 21st century when we humans have gained the ability to not only shape culture, but to change biology

and the physical world. How we use this ability may prove a greater challenge than gaining it.

Evolutionary cycles

The stories of our ancestors tell us three more things. First, they demonstrate how evolution happens in cycles. For example, the generations of Homo Sapiens emerged, developed and matured, then declined and disappeared. There seemed to be a creative surge that led them to succeed as a species, but then a rigidity and inability to further adapt that led them to fail.

Second, they show that the beginning of these cycles goes entirely against the principles of natural selection. Rather than random variation of parts, the new generations appear to have emerged whole, with the potential to evolve in particular ways. Some sort of threshold seems to have been reached and sudden leaps somehow made. Thus far we have no explanations for these discontinuities.

Third, the stories tell us that where an evolutionary leap ends, and therefore where a new generation begins, is crucial. What a species or generation will become is enfolded or contained within this ending and starting point as creative potential on the one hand, and a set of limits on the other.

The pattern of emergence, development, and decline, and the sudden appearance of new wholes is typical of evolution. And we have much evidence that we are reaching the end of generation three Homo Sapiens. Will our species survive? What sort of leap is required? Will it just happen naturally, or is it something we humans can guide? If we can guide it, what directions should we take?

Core Ideas

- 3.1. Using a variety of evidence and new techniques and tools we have learned much about where we came from.
- 3.2. Our early ancestors include Australopithecus Afarensis, Homo Habilis, Homo Erectus, Archaic Sapiens, and Neanderthal.
- 3.3. Each of our ancestors developed and thrived for a period of time then either adapted to changes in the environment or disappeared. Neanderthal failed to adapt and became extinct, while the Archaic Sapiens evolved to become the modern human being.
- 3.4. There have been three generations of modern human: the Cro-Magnon, followed by humans of the agricultural and industrial revolutions.
- 3.5. Geological, biological and cultural evolution involve different processes and occur on different timetables. Cultural evolution has now gained prominence because of its speed and impact.
- 3.6. Evolution occurs in cycles of birth, development, and decline. The beginning of an evolutionary cycle is marked by the emergence of a new whole, not just a changed part.
- 3.7. We are on the brink of a fourth generation of modern human. What that generation will become is unclear.

Activities

A. Five billion years. Three and a half billion years. Five to seven million years. It's hard to think in terms of billions and millions of years and to see how very short our lives are. Maybe this analogy will help. Pretend that you are as old as the human species. That age, five million years, is 1,000 times smaller than how long ago the earth took the form we see today, five billion years. So multiple your age times 1,000. If the human species were as old as you, this would be how long ago the earth settled into the form we see today.

Try it the other way around. Divide your age by 1,000 and figure out how many weeks or days that would equal (after dividing,

multiple by 52 or 365). If the earth has been as we see it today for as long as you have been alive, this is how old the human species would be.

Try this with other ages, like the emergence of modern humans (200,000 years ago) or the 2,000 years since Christ's birth.

B. Look at photographs of members of your family, photos from earlier generations if you have them. Examine your relatives facial features and compare them with your own. Do you have your grandfather's nose? Your great-grandmother's ears? If you don't have pictures of your own ancestors, just find some paintings or pictures of people from earlier generations. Look at their clothes and the sorts of things that may be in the background of those pictures. Think about what they did, how they spent their days, how they traveled and communicated with one another, and so on. How have biological and cultural evolution shaped who you are?

C. Think about what each part of your body does. Are there parts that you use very heavily? Parts that you don't use at all? What do you imagine will happen over time and generations to these parts if that pattern of use continues?

D. Explain where our species came from to an 8-10 year old child.

E. If we are about to leave generation three Homo Sapiens behind, what do you wish for generation four? What do you wish humans to become? What do you think being "human" should mean a thousand years from now?

4. Where are we going?

Where do we go from here?

Chicago

You'd better make up your mind.

Big Wooden Radio

Our story so far

What have we learned so far? The story of our species, like the story of other species that survive today, is one of gradual change interrupted by sudden leaps. Somewhere around six million years ago *Australopithecus Afarensis* moved from the trees to the savanna suddenly departing from the chimpanzees and apes. Four million years later *Homo Habilis* and *Homo Erectus* learned to create tools and cook in pots. They represented the turning point from an ape-like past to a human-like future. Two hundred thousand years ago the *Archaic Sapiens* learned to prepare raw materials from which other products could be made, and the Neanderthal found shelter in the caves of Europe and Asia. Then somewhere around 50,000-40,000 years ago, the first generation of modern human beings emerged with the remarkable intellectual, social, and technological development of Cro-Magnon. The agricultural revolution of the second generation followed just 10-12,000 years ago. Then the scientific-industrial revolution established the third generation in just the last 500 years.

In this story there are many lessons for us. First, changes happened in cycles. A new species suddenly appeared; it developed and matured; its patterns became stable and resistant to change, causing it to lose its ability to adapt; and it declined and disappeared. This is true not only of distinct species, but of the generations of modern human. Second, change appears to be rapidly accelerating. It took four million years to get from *Australopithecus Afarensis* to *Homo Habilis*; only 165,000 years to get from *Archaic Sapiens* to modern human; and the third generation of modern humans appeared less than 10,000 years

after the second. Third, change processes were co-evolutionary. In each of the leaps we can find changes in how our ancestors related to one another, the patterns of their lives, how they acquired and used resources, their technology and means of communication, their relationships with nature, and so on. All these things changed in relation to one another—they co-evolved—and a harmonious interaction among them was required for the species to take hold. Fourth, evolution is now primarily cultural.

Consciousness

A fifth lesson we can draw from the story is that the leap in consciousness as each of our ancestors emerged was key to our becoming human. By consciousness we mean the ability to see ourselves as separate from the world—to observe ourselves in relation to others and our environment.

Archaic Sapiens like the Neanderthal did not have what we consider human consciousness. In essentially the “dream-like” state of many animals, they were unable to see themselves as individuals separate from others and the world. Their connection was to nature, that is, they were entirely embedded in nature and made no distinction of self from it.

It was the Cro-Magnon who made the leap of separation of self from others and nature. They likely saw how and why things happened as magical, rather than in terms of some rational cause and effect, but evidence such as paintings clearly demonstrates the ability to see themselves as distinct.

The three generations of modern humans took a series of leaps in consciousness, deepening our sense of self and community, our intellectual capacities, and our emotional lives. The first generation’s self-reflective consciousness was sensory and magical, the second, emotional and mythical, and the third, mental/logical. Across these generations we developed complex

languages to represent our thoughts, showing how the development of our nervous systems and brain, the creation of languages, and consciousness co-evolve. We developed the ability to wonder, to introspect, and to consider not just what is but what might be. From the early explanations of gods in the earth and sky, we developed scientific understandings of how the world works. And we developed a multi-dimensional perspective, allowing us to see ourselves separate in space and time.

Taking perhaps the most profound step, here at the end of the third generation we have developed an understanding of the processes by which we came to be the way we are—we have developed evolutionary consciousness. Evolutionary consciousness is likely to be the key as we shift the view from where we came from to where we are going.

The end of Generation 3

So where is humanity going? We really don't know. We know how we came to be as we are today, and our knowledge of this process tells us that what we do now will make a difference in the future. But the future remains unpredictable. How all of our actions will combine, how our environment will change on its own and in response to our actions, how and when a new generation of humans will emerge, and how they will think and act are unclear.

Below are some possibilities, some directions that humanity might take in the near term. These certainly don't represent all possibilities. Nor do they imply specific actions that would take us in particular directions. We just intend to suggest where humanity might go given some of the forces that exist today.

One thing seems very clear, however. We have reached a turning point. Generation 3 of modern human is in decline. Its patterns have stabilized and have become rigid. It is growing further and further out of sync with its environment, and its

inability to adapt to change is pushing it rapidly toward collapse. You may think that is an awfully drastic statement to make about humanity. Consider the evidence.

- Technological development in the 20th century was truly remarkable, so remarkable and so rapid that the social and ethical systems necessary to guide it never caught up. We are closing in on the ability to create human life with whatever characteristics we choose, but with barely any collective consideration of what those characteristics should be.
- We have moved from an industrial age requiring masses of laborers to an information age requiring continuous learning. Rather than people who are physically skilled to work in particular occupations for a lifetime, we need workers who are able to adapt as the skills required in their jobs change by the year, if not the month. Yet at the same time, our educational systems maintain the structures and processes, in some cases even the content, of the industrial age.
- We have found the means to extract and produce vast amounts of energy to fuel our industries and ways of life. Yet the extraction, production, and use are destroying our natural environment. Our farming practices have dramatically increased the productivity of our farms, yet have contributed to washing the topsoil we rely on for growing food down our rivers. We've developed useful chemicals but have sent them into the atmosphere, threatening our protection from harmful rays. We've found the means to exploit the power within the atom, yet have used this to create weapons that could destroy our planets' surface, taking us with it, and waste products that will remain harmful to us for the next six million years. We've learned that diversity is key to survival, yet our actions have created the conditions for mass extinction of species. In fact, many scientists agree that we are now experiencing a mass

extinction, on the order of 30,000 species lost per year. To put this in perspective, the last mass extinction was 65 million years ago!

- A small percentage of the earth's peoples now enjoy an unprecedented degree of personal freedom. We can live where we choose, work in the areas we wish, and form social bonds if and when we want. But with the gain of independence we've lost our sense of family and community. Personal, material gain has become more important than social connection, and this shifts our attitudes away from social benefit and service. We increasingly depend on laws and police to maintain order, and lawyers and lawsuits to settle disputes. We think something is wrong not because it caused harm but because we got caught.
- Medical advances and our knowledge of nutrition have allowed the Earth's human population to grow rapidly, so rapidly that it is unclear if food resources can be developed to keep us alive in the 21st century.
- Scientists have found that the simple cause-and-effect reasoning of the industrial age does not explain the behavior of complex systems, and that complex systems include things like the earth itself, the weather, and human beings. Yet our institutions, our governmental policies, our laws, and so on, still rely on simple cause-and-effect logic.
- Communication technologies have spurred the development of a global economy. This has allowed the quality of life of some people to improve dramatically in a very short period of time. At the same time, it has created an enormous and continually widening gap between rich and poor, and it threatens to destroy the individual identity of cultures and countries. Most people don't yet recognize that global economic forces already far exceed the power of national governments, including that of the United States.

We could offer other examples. The point is that our social systems no longer reflect the reality in which they are embedded. They were designed for a bygone era and have not co-evolved with their environment. We see in their resistance to change, the end of an evolutionary cycle and the decline of Generation 3 modern human. We humans face the challenge of transformation, not just transition.

Future possibilities

So where might we go? Here are some scenarios of what might be ahead.

- Suppose we focus on technological development. We might find human relations maintained largely via attached or implanted electronic devices. We would be connected “24-7,” in touch with one another instantly and continuously worldwide. We wouldn’t need to be in a particular place to work or learn, we could just “connect” from wherever. Computing would be an embedded capability in everything, including us, making the boundaries between human and machine blur then disappear. Another blurred boundary would be between what is real and what is artificial. For example, we may develop dust-particle sized computers, so small that by filling the space around us, their simple action of reflecting light back to us in different colors would create a scene that we could not distinguish from reality. Our encounters with objects and each other in these virtual realities might be commonplace. In a sense, we would lead multiple lives.

- Another future scenario emphasizing technology development would have us creating who we wish to be via genetic engineering. Each generation would be a product of the previous generation’s desires and the manipulations that were available. If one of our body parts had a problem, we could replace it. If we wished to delay aging, we could rejuvenate our bodies and live for hundreds of years. When the Earth’s population density became too great,

we would move offworld, to space stations and other planets.

- In contrast, suppose our future was dominated by economic forces, a free market economy in particular. We might have a global government, subject to no national rule, Nation-states would grow powerless in the face of global economic forces and would be superceded. A single worldwide language—based on proportion of internet use, Chinese—would be instituted so that everyone could speak freely with everyone else. This government might be able to keep local conflicts from escalating into large-scale wars. Reasonable work conditions could be insured because a single institution oversaw them worldwide, and the free market would mean great freedom for individual initiative and choice.

- Another possibility is a future in which human relations are given priority. We might create a civil society in which everyone had the right to know about issues that affected them and the ability and responsibility to participate in making decisions. Rather than debate by the few in power and control by authorities removed from the situation, individual communities would engage in new forms of participative self-governance.

It's up to us

There are several important things to notice about these sorts of scenarios. First, these are not wild futuristic visions. Every single possibility mentioned above is based on an effort that is already underway!

Second, the scenarios are not mutually exclusive. For example, a certain attitude toward technology development doesn't make it impossible to have different systems of governance or economy. The areas emphasized by the scenarios interdepend. Worldwide "24-7" communication technologies enable a global economy. Local self-governance works against a strong global government. And embracing virtual realities challenges the notion

of community based on physical location. In fact, the various areas are so connected that we might apply the systems term *tightly coupled*.

Third, each scenario has potentially positive and negative consequences. We've focused more on the positives above. Here are some negatives. Allowing technology development to proceed unrestrained would lead us to view resource depletion as an acceptable tradeoff for our style of life. We would simply trust science to find alternatives as they became needed. For example, when farmlands could no longer sustain agriculture, we would eat what bioengineering or nanotechnology could create (e.g., other resources turned into food by biological nanobots). Of course, those who couldn't afford the nanobots would starve.

Similarly, heavy focus on a free market economy would create wider and wider gaps between rich and poor—winners and losers, with their lives as the stake. It would lead to a loss of local control and local culture. Money would go where individual global investors saw potential profits at the moment, so local economies would succeed or fail based on global forces and the short-term decisions of global investors. And with the same goods and services available worldwide, at lower cost than small businesses could match, local businesses would be pushed out of the market.

Even the humanistic or civil society described above has potential problems. We could lose much of our personal freedom having to make all our decisions as a community. We could become so trapped in thinking things over that we could not effectively respond to immediate threats. Decisions based on local concerns could backfire in the face of global forces. Decentralized governance could even open the door to groups with extreme, selfish goals to proceed without strong opposition.

The point here is that there is no utopia, only better or worse

circumstances. Any decisions we make have potentially positive and negative consequences. But understanding that everything relates tells us that these consequences cut across areas like technology and economy, and go beyond local situations. Our decisions need to be based on local AND global perspectives, and to be grounded in the complexity of our world rather than the simple views of individual disciplines or areas that we humans invent. It seems wise to apply *systemic evaluation* to past and proposed actions, to look at the whole system rather than just parts.

Fourth, it is important to notice that it is natural for us, or any system, to resist change. The scenarios above involve major changes in our style of life, the ways we communicate and learn, how our society is organized, how we obtain and utilize resources, the nature of our technologies, our relationship with the natural world, and so on. We perceive that these changes complicate our lives, so we resist them. We may try to preserve the status quo or advocate a return to the “good old days.” But this focuses our energies on what to avoid rather than what to embrace. As a result we never really get what we want.

Maybe the distinction mentioned earlier will help. *Complicated* means many things, while *complexity* means many things that are integrated. Rather than seeking simplicity or reducing complication, we need to seek integration and complexity. In fact, evolution is a movement toward greater complexity, so seeking simplicity works against evolution.

Lastly and most importantly, every aspect of the scenarios above is at least partly the result of purposeful human action. We may not be able to predict the future with a great deal of precision, but we surely will affect it, and how we do so is up to us. Generation 3 modern human is in decline. What Generation 4 will become is up to us. For the first time in history, we face the challenge of becoming a new generation with knowledge of

evolutionary processes. We have attained evolutionary consciousness, and now have the opportunity to consciously evolve.

Core Ideas

- 4.1. Generation 3 modern human is in decline. Its characteristics are no longer in sync with its environment. It must either adapt or face extinction.
- 4.2. The emergence of each generation of modern human was marked by a leap in consciousness.
- 4.3. Evolutionary consciousness is a promising marker of Generation 4.
- 4.4. There are many possible futures. They will bring us better or worse circumstances, not a utopia.
- 4.5. Such areas as politics, economics, technology, and culture interdepend, so our chances of creating better circumstances for the future are improved by taking a systemic perspective.
- 4.6. The transformation to Generation 4 will not be easy. It requires that we embrace rather than resist change and seek complexity rather than simplicity.
- 4.7. We cannot predict exactly how our actions will affect the future, but they certainly will do so.

Activities

A. Look around the space surrounding you at this moment. Ask yourself why it is the way it is. For example, if you are indoors ask why the room is a certain size and shape, why the ceilings are a certain height, why the floors are a certain material, the lights and furniture arranged in a particular way. Who caused these to be this way? Imagine what human surroundings will look like in 100 years. Create both positive and negative images. What human actions today would lead toward the more positive or more negative images?

B. Read a science fiction story or think about one you've read in

the past. What actions and events in the next few years might make the story come true? Did we experience Orwell's vision of 1984? Clark or Kubrick's vision of 2001? Why/why not?

C. Think about your great great grandchildren. What do you wish for them? What could we do today to ensure this future for them?

D. The three generations of humans appear to have been organized around three levels of consciousness: a sensory/magical consciousness, an emotional/mythical consciousness, and a mental/rational context. What new consciousness should we seek to develop to guide the emergence of generation four? A spiritual/ethical consciousness? How could we do so?

5. Can I make a difference?

If you want to be somebody else, if you're tired of losing battles with yourself, change your mind.

Sister Hazel

Nelson Mandela became the President of post-apartheid South Africa. The Berlin Wall was peacefully deconstructed. The USSR split apart. Who could have guessed just decades ago that these things would happen? Instantaneous worldwide communication. Space tourism. Cloning. Real-time translation of speech. How could science fiction so quickly become fact? Ours is an age of extraordinary change. What we imagine one day as a possibility soon becomes a part of everyday life. But do we as individuals have any influence? Can we make a difference?

Change is possible

Yes, individual humans can make a difference. What would our understanding of physics be without Einstein? How would our music sound without Mozart? What would the political map of Europe look like if there had been no Hitler? Would there be a United States without Abraham Lincoln? What would be different in the lives of Americans without Martin Luther King, Jr.?

Recorded history is filled with the names of individuals who, for better or worse, had a major impact not only in their time and in their surroundings but on generations since. Whether in terms of our understanding of the universe or the way in which we perceive ourselves and each other, these individuals changed the world. They shifted the path and made the stories of our societies different.

One thing they had in common is the belief that change is possible, that the conditions they observed could be made

different. They could argue a position and lead to different decisions. They could experiment and find new relationships and understandings. They could create music and art unlike that which they heard and saw. They may not have followed a grand plan or vision, but they believed that their actions could make a difference.

But aren't they rare individuals—geniuses, great artists, and great leaders? Is there any point to comparing their actions to our own?

Individual actions have meaning, sometimes enormous effect

Have you ever heard of Cristoph Willibald Gluck? Gluck was as popular a composer in Mozart's day as Mozart. In fact, Mozart was buried in an unmarked pauper's grave, and the few people who attended his funeral did not even walk to the cemetery because it was raining. Similarly, if you said "Bach" in the late 1700s more people would likely have thought of Carl Philip Emmanuel Bach or Johann Christian Bach than their father, Johann Sebastian. So, some people's work is unheralded in their lifetimes and celebrated long afterward. Others are recognized in life and soon forgotten afterward. Their names aren't prominent in history because their ideas didn't catch on, their art didn't strongly influence others, events don't appear to have been shaped as a result of their discoveries.

Think about history in general. History is written by historians, by people who examine evidence from the past, interpret events, and tell stories. What do they tell stories about? About things that led to other things. About people who influenced others. About events that seemed to cause major changes. Were those people and events known to be important at the time? Not necessarily. The future impact of their work was unclear. In other words, we know what changes history only in retrospect. Predictions are often far off the mark. For example, the Internet was expected to be a small-scale network of maybe five or six

computers, and massive computer failures were anticipated as the year 2000 arrived.

So some actions, events, discoveries and inventions have great impact while others do not, and we know with certainty which is which only by looking back at them in the future. We'll return to why in a moment. First it's important to appreciate that some things do indeed have profound impact—impact well beyond what seems reasonable at the time.

This is known in chaos theory as the “butterfly effect.” Theoretically, a butterfly flapping its wings on one side of the earth can change the weather on the other side. That sounds absurd, but the analogy is a good one. The more we learn about our world the more we find interconnections—everything relates. Weather, for example, is the result of a huge range of dynamic factors, and a minor change in one factor can have a large impact. Let's say that water vapor is very close to changing into rain. A minor change in temperature may be all that's necessary to trigger the difference between a cloud that floats by and a rainstorm. Take this story further: the minor change in temperature was caused by a slight shift in air current as a jet flew by. The jet flew by at this moment because the pilot made a slight course change. The pilot made a slight course change to see if she could gain a little more speed. She wanted a little more speed to make up for a short delay in boarding. The boarding delay was caused by a passenger having trouble stowing his suitcase. The passenger's suitcase was too large but the steward let it go because he was in a good mood. Did the steward's mood cause it to rain? Actually, yes! But it was one of thousands of factors involved. And it just happened to be that the system was in a state which allowed a very minor difference to trigger a large change.

The impact of actions depends on conditions

If the water vapor in the cloud had not been very close to

condensing, the jet would not have made a difference. The pilot and steward's actions might have had other consequences but would not have led to rain. What determines whether an action or event has a large impact? More than anything in the action or event itself, it is the conditions in which it occurs. In a very real way it is a system's readiness or *sensitivity* to being influenced that determines the impact of an event or action. Similarly, we may have what we think is a great idea, but if the conditions aren't right then it may go nowhere. For example, others need to recognize it as good, to perceive that it has a *goodness of fit* with their understanding of the situation.

If we accept that conditions are so important, then we have to also accept that there is a right time and place for actions to have impact. If they are taken elsewhere, or if an idea comes up in a different age, then it may not have any impact at all. Would we have ever heard the name Marco Polo if his father and uncle had not been traders who took him on their journeys to the far east? Would we know Maya Angelou's poetry if she had been born a century earlier? If Germany had not been humiliated by the conditions of the Treaty of Versailles at the end of World War I, would anyone have listened to Hitler's words? If Mozart were born in 1950 would he play rock and roll? Would Martin Luther King, Jr.'s words have gained any power if he said them in 1920 rather than 1960? If Jesus or Mohammed or Buddha walked among us today would we notice?

It's a matter of context. A great idea at a time when the resources and tools to make it real are available. An event in an environment that gives it meaning. A confluence of action and conditions making something possible.

Making a difference

But if context is so important, then how can we make a difference on purpose? How can we know which action to take

when, or which idea will be more powerful? We cannot know these things with certainty, but we can study conditions carefully and use this knowledge to determine which actions and ideas may have more potential. By doing this we may find the trigger or catalyst for change, or we may push the system slightly toward a condition in which another trigger will have greater power. Notice that at the time we don't know if our action will simply prepare the system for change or will prove to be the trigger. The action is the same. We know the effect only in retrospect.

Our chances of making a difference are enhanced when we appreciate the fact that *we* can do far more than *I* ever can, also. Conscious evolution is a social process, not just a matter of individual genius or leadership. We can make more of a difference by engaging with one another, by participating. When we collaborate with each other we can build off of each other's ideas. We can evaluate the potential of ideas and actions from more perspectives. We can rely on one another's knowledge of resources and tools. We can help each other take action.

Working together is important not only for what can be achieved. It is important for determining what we attempt. What we decide and what we create are a part of us. Our decisions, actions, and creations are part of who we are. They reflect what we value and believe, and what we aspire to become.

We rather than *I* isn't just a matter of size of effect. It's a matter of ethics. It is ethical to create the future *with* each other. It is not ethical for one individual or group to create a future *for* another.

So, can you make a difference? Yes, but if what you want from it is fame or credit, then you'll likely be disappointed. You'll never know the true effects of your contribution. Instead you'll know that you worked toward a worthwhile goal—in this case, the

goal of sustaining the human species.

Core Ideas

- 5.1. Change is possible. The past does not completely determine the future.
- 5.2. Individual actions can make a difference. Depending on conditions, small actions can have major effects.
- 5.3. The same action may trigger a major change or better prepare a system for such. The person who takes the action and others can know the difference only afterward (if ever).
- 5.4. History tends to tell us about the trigger, the isolated event or action, rather than the preparation, so we tend to believe deceptively simple interpretations of complex situations.
- 5.5. Our ability to consciously evolve is greatly enhanced by working together, by engaging with one another.
- 5.6. It is ethical to design *with* not *for* others.

Activities

A. Think of an important invention not mentioned in this chapter. What social, political, and economic conditions made it possible for that invention to be widely adopted.

B. Imagine that you were born in a different place at a different time. What would be better or worse? How about if you were born today in a different family, with a different gender, or a different race?

C. Ask yourself what motivates you to act in a certain way. For example, would you take action if no one would ever know what that action accomplished?

D. Ask a friend the following questions: Under what conditions is it ethical to create things *for* others rather than *with* them? Under what conditions is this not ethical?

6. How can we create the future?

Wounded in the battle
Lying in the weeds
Immersed in contemplation
Of history's evil deeds
He offered up to free will
Free will flatly replied
Conscious evolution's all there is on your side
Jeb Puryear and Johnny Dowd

Harold: You sure have a way with people.
Maude: Well, they're my species.
Harold and Maude

There are good reasons to work together. Groups can accomplish more than individuals. No one can predict which of our efforts will trigger change and have a large impact, so many simultaneous efforts increase our chances. And by working together we insure that our efforts serve us all rather than a few.

But in years of schooling we learn to work independently. We read and study alone. We work with "personal" computers. Even in "groupwork" we collaborate with a few people who are like us in age and background. Then we take tests by ourselves. How can we create the future not just for ourselves, but for our communities and societies, and for our species?

We propose five major actions:

- (1) design the future rather than plan or try to fix the past;
- (2) think in terms of systems and interdependencies;

(3) uncover values, beliefs, and assumptions

(4) focus on communities and on education;

(5) find new ways of being together

(1) Design the future

There are four approaches we can take toward the future. We can say that it is outside our control, do nothing, and let it happen to us. Or we can view it as merely an extension of the past and just try to fix our mistakes. Or we can predict trends and plan to take advantage of them. Or we can create images of the future we wish for and take steps to make that a reality—we can design. The last approach has the most potential for leading to the emergence of Generation 4 modern human.

There are many aspects of design. Here are some aspects expressed as principles.

- Design by carrying out these processes: understand and transcend the current situation; create alternative images of a desired future; compare and select the image(s) with most potential; transform the situation by bringing the selected image to life.
- Use reason and intuition, rationality and creativity. Use both sides of your brain.
- Think in terms of judgments and consequences, not right or wrong decisions. There are no right and wrong decisions in designing. By definition, design creates something new, something whose effects cannot be entirely predetermined. So to say that a design is right or wrong is to use the past to evaluate the future. Instead, learn if a judgment is wise by observing its consequences.
- Be proactive rather than reactive. Being reactive only fixes or eliminates things that exist. Getting rid of what we don't want

doesn't give us what we do.

- Similarly, focus on doing the right thing rather than the wrong thing righter. Efficiency means doing more in less time for less cost, while effectiveness means accomplishing goals. Focus first on effectiveness. Otherwise we can waste much effort and create ways to more efficiently do things that are not relevant to our goals.
- Embrace diversity. Include members in the design team who bring as widely varying perspectives of the situation as possible. The designs we create will have greater potential to succeed in the situation and greater ability to change when the situation changes as a result.
- Think about solutions and problems together. Trying to figure out all of the “problems” before attempting to solve any of them is a trap. There's no end to it. Instead, use solution ideas to understand problems. Let the two inform each other. The result will be designs that are better matched to the complexity of the situation.
- Don't try to control everything. Most situations, and certainly those we are considering here, are dynamic and complex. So, designs need to be flexible and to have built-in mechanisms for adaptation over time.

(2) Think in terms of systems and interdependencies

In situations that are dynamic and complex, the consequences of actions are difficult to predict. Changing something in one area will affect other areas we may not have realized were connected. And the nature of effects in the areas we thought of, and those we did not, may be surprising. So, what do we as designers do?

We need to be systems thinkers. This means assuming things are related and connected until we have clear evidence that they

are separate, rather than assuming the opposite. It means creating systems that match and fit the complexity of the situation and seek to change it, rather than solutions to isolated problems. It means seeking greater differentiation and greater integration, and recognizing that it's desirable for things to become more complex as opposed to more complicated. It means testing and evaluating designs by looking at their widespread consequences, not just at what they do in an immediate time and place.

Systems thinking also means that we recognize that situations and designs are themselves interdependent. Just as a wooden bowl will change the taste of the soup it contains, the situation shapes the design as much as the design changes the situation.

These thoughts on systems design apply to a new electronic device or to an organization or anything else that we can create. What does it mean to design a system when we talk about society and Generation 4 modern human? It means creating an integrated set of socio-cultural markers, for example, a world view, a set of ethical and moral standards, ways to communicate and learn, ways to organize our everyday lives and relate to one another, ways to nurture our physical, mental, emotional, and spiritual wellness, the manners in which we engage in social action, acceptable practices for obtaining and utilizing resources, the nature of our economy, our attitudes toward science and the knowledge derived from it, our sense of aesthetics and the ways we seek to enrich the quality of our lives, our system of governance, our development and use of technology, and how we relate to nature. As we learned from studying our ancestors, we must achieve harmonious interaction among these for a new generation to take hold.

As we have throughout the book, we use *systems* here to imply wholes and interdependencies, not standard approaches. The situations for which designing is necessary are unique. Their parts are unique. The relationships of those parts to one another are

unique. What they become together is always different.

Being a systems thinker means looking for and appreciating interdependencies, not applying single answers regardless of the question.

(3) Uncover values, beliefs, and assumptions

Few of our actions are random. We do things because we expect them to have certain outcomes. We walk one direction rather than another because there is somewhere we wish to reach. We choose foods at a restaurant or grocery because we think they will give us pleasure and better health. We vote for people because we believe they share our views on issues and will act in our best interests.

If our actions are based on goals, where do our goals come from? There are many factors we consider, consciously and unconsciously, when we form a goal. But even simple goals, like “make it to school on time today” or “save money” can be traced to underlying assumptions, beliefs, and values.

Say that you decide to go for a walk after dinner. You choose a certain route because you *assume* that it will be safe and that your heart and lungs will handle the strain. You select certain shoes and clothing because you *assume* they will be comfortable and will protect you in the weather. You may take the walk because you *believe* that walking is good for you, that exercise will improve your health, and that better health will lead to a longer life. Given these beliefs, you choose to walk because you *value* fitness and longevity.

These assumptions, beliefs, and values are often not readily apparent to us. In fact, the “communication revolution” seems to have done more to hide them than to expose them. We are bombarded with more and more information daily, but rarely is

that information accompanied by a clear sense of the source, or the perspective that was taken, or the evidence that claims were based on. We seem to be getting more and more information but less meaning, more channels but the same voices, more media but the same messages. And throughout we get simple stereotypes while we ourselves, our relations with others, and the situations we encounter daily are not simple or stereotypical. They are dynamic and complex.

This is okay if we want to maintain the status quo or accept the directions that those few people with wealth and power will take us. It is insufficient and unacceptable if we choose to create a desirable future for all humanity. For that we need to expose underlying assumptions, beliefs, and values, find common ground among them, then use that common ground to design.

It is not up to us (the authors) to determine what future should be created or what values should be primary. But there are a few basic guidelines that our understanding of systems and design suggests. We'll share three here. We consider them to be key ethical principles to follow as Generation 4 of our species emerges. The first extends a point made in Chapter 5.

- Design *with* and *within*, not *for*. It is the right of people to guide their destiny, to take part directly in decisions affecting their lives. Therefore, designing is something for everyone to do, not for an outsider to do for others.
- Think bigger and farther ahead. Because of interdependence, our actions affect things beyond our personal setting and circumstances. Therefore, in designing we need to think globally and well into the future. We need to think in terms of a global culture and make judgments based on their impact on future generations.

- Look for AND relationships rather than OR. We can value individual freedom, social justice, AND ecological harmony, not trade one for another. We can respect cultural tradition AND the artist working at the cultural edge. We can rely on the wisdom of the past AND be inspired by the future.

(4) Focus on communities and on education

We have said that it is important to design the future rather than just plan for it or try to fix the past, to think in terms of systems, to uncover values, beliefs, and assumptions, to design with and within, not for, to think bigger and farther ahead, and to look for AND relationships rather than OR. Underlying all these principles is a shift of mindset from the individual to the collective and from the present to the future.

These are signs of the emergence of Generation 4 modern human, and they already can be seen in many areas: a new view of interdependence and wholeness; an appreciation of dynamic complexity and what it implies for our actions; a new sense of spirituality and connection with nature; a heightened economic and social interdependence through global communication; groups exploring truly participative democracy; calls for ethical guidelines for new science and for technology that serves the common good. We're asking different questions and getting different answers about ourselves and the world.

How these developments will interconnect is not clear, but it is imperative that they do. Otherwise, each will fail to take hold and the patterns of Generation 3, already in decline, will persist. It is, therefore, no exaggeration to say that the future of our species is at stake in this interconnection.

We don't know what connections will be made or how, but there is a most promising answer to where—in communities and in education. The most likely place for the kind of work that is

necessary to bring the various developments together is an authentic, sustainable community, one of people who are intimately intertwined in their everyday lives and committed to creating a healthy environment for themselves and for their children.

Within and across these communities, education is key. Today we have predominantly *maintenance learning*. We school our children in what is already known and expect them to take it on faith that this knowledge will be relevant in their future. We slice the world into subject areas and separate what can and cannot be studied into grades. We impose more and more testing in response to students not memorizing enough facts and figures or not gaining the ability to apply standard rules in known situations.

Maintenance learning offers little help in creating the future. Instead, we need to create educational systems and approaches that are evolutionary, for example: evolutionary learning to help learners of all ages face unexpected situations, find and build connections; approaches that nurture respectful and caring relationships rather than competition, that offer a wide range of learning approaches and resources; tasks that learners themselves see as relevant; and goals that focus on evolutionary consciousness and the capacity for conscious evolution.

(5) Find new ways of being together

A question remains. What do we do in communities and in education that will lead us toward conscious evolution? In other words, what approaches will help us make connections, find common ground, create images of desirable futures, and select and plan to make those images come to life? It seems necessary for us to find a new way to be together. Our interactions today are guided by a mindset of competition. We fight for the floor, insert ourselves in momentary silence, and attempt to convince each other of right (me) and wrong (you). This discourages listening and

meaningful collaboration, the very things necessary for us to create a future together.

The words *dialogue* and *conversation* are now being used to describe a different way of being together. In a conversation, groups of people focus on particular issues and are guided by carefully worded triggering questions. They take time to think before speaking. Everyone has an opportunity to share their thoughts. Everyone else listens. Time is important, so a conversation may last a week or be continued over years rather than stay within the artificial constraint of an hour.

Conversation leads to a deep understanding of each others' perspective. Rather than saying "no, you're wrong" participants ask "what do you mean?" They listen and learn. The common ground that results is deeper, richer, and firmer. It allows whatever the group builds to stand more strongly.

Conversation opens up creative capacity. Truly listening and reflecting allows participants to see connections more clearly. It opens them to possibilities rather than closing them off to views that they do not immediately share. It allows them to see AND rather than OR relationships.

Participants in a conversation often find themselves in a special state of consciousness. Time seems to move at different speeds, emotions are heightened, and an unexpected level of energy emerges for both the individuals and the group. This is the same experience that athletes have when everything comes together and they perform at a high level. It has been called peak experience, liminal state, and flow.

Imagine communities around the world engaged in conversation, each designing the future for itself. Each recognizing its interdependence with every other community, thus leading it to find means to collaborate. A global culture based on self-design.

Conscious evolution. Generation 4 modern human.

New Agoras

We may find inspiration in the Agoras of classical Greece. The Agoras were places of assembly where democracy was practiced. Each year forty assemblies were held and citizens had the opportunity to deliberate and make decisions about issues that affected their lives and the lives of their communities. The proceedings were governed by a democratic constitution, and this constitution brought everyday citizens into an active role in the service of the common good. Perhaps we can bring the Agora concept and experience back to life. True participative democracy could become the guiding idea for our society and the engine for conscious evolution. The Agora as an image of a self-designing community might capture our imagination and help us see possibilities.

Core Ideas

- 6.1. Designing is different from planning or trying to fix what exists. It involves imagining new possibilities.
- 6.2. Designers use reason and intuition, depend on judgments rather than decisions, are proactive rather than reactive, and embrace diversity of viewpoints.
- 6.3. Most situations of importance are dynamic and complex and require systems thinking.
- 6.4. To be able to work together we need to uncover and understand our own and each other's assumptions, beliefs, and values.
- 6.5. Communities and education have the most potential for making connections among new developments that will lead to Generation 4 modern human.
- 6.6. Conversation represents a new way of being together. It is a powerful tool for designing, systems thinking, and uncovering assumptions, beliefs, and value. It offers much to the development and ongoing work of communities and education.

6.7. Conscious evolution might be manifested in a global culture of community self-design—new Agoras.

Activities

A. Think about an action you took recently. What did you intend to accomplish? What were your general and specific goals? What assumptions did you make? What beliefs and values guided you?

B. Reflect on recent discussions you have had in which you did not agree with another person's point of view. What assumptions did you make? What assumptions did he or she seem to make? What values and beliefs led you to your point of view? What values and beliefs likely led to his or her point of view?

C. If you woke up tomorrow morning and found yourself living in a community dedicated to self-design and to creating a better future for its children, what would you see? What actions would you take on a daily basis? How would you relate to other individuals, other communities, and to the natural world? What would you value most in living in that community?

7. Conclusion

We have come a long way from Australopithecus Afarensis, Archaic Sapiens, and Cro-Magnon. By geological and biological standards our species has developed at an astonishing rate. Cultural evolution has now come to the fore, and a new generation Homo Sapiens is necessary and has begun to emerge. What that generation will become is up to us. The future is affected by the past, but it is not determined by it. We humans can and must shape its direction. We have gained evolutionary consciousness, and with it comes the responsibility of conscious evolution.

We stand at a threshold, the end of one evolutionary era and the beginning of another. It is a time when small things can have profound impact. What we do now will have dramatic consequences for future generations. It is an ethical imperative that we act with those generations clearly in mind.

To cross the threshold we must accept the responsibility to guide evolution. This requires several things of us: global systems thinking and an understanding of dynamic complexity; the will to design and the capacity to continually let go of the past and embrace the new; and widely agreed upon ethical norms to guide our actions.

Ours is a time of great confusion and great possibility. The future of humanity is in our hands.

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