

# **BLIND SPOT**

## **The Unforeseen End of Accelerating Change**

**Peter Russell**

Warning: The following challenges one of our deepest held paradigms—our view of humanity's future and place in evolution. As a human being with an investment in the future of our species, you may find yourself profoundly disturbed and resisting its conclusions.

### **Overview**

That humanity and the planet are in crisis is clear. Moreover, the severity of the crisis is now beginning to hit home. Recent reports suggest we are in the early stages of the sixth major mass extinction in Earth's history—this time caused by one of the planet's own species rather than an asteroid or comet impact—and if we do not change our ways radically and very fast, then we, along with many other species, will become extinct in a century or so. And it is our own fault.

At least that is the story we are told. Here I propose a new story of human evolution—not the kind of new story that many people are calling for in which personal and social transformation help us avoid immanent extinction and move on to a sustainable long-term future. In this radically different new story, there is no long-term stable future ahead of us.

We are coming to the natural end of our species' journey, spinning faster and faster into the center of an evolutionary spiral. However fast we find the pace of life today, one thing is sure, twenty years from now it is going to be much faster, and twenty years after that much faster still, and twenty years after that... almost unimaginable.

Some look at where this acceleration is taking us technologically; to the so-called singularity when computers surpass human intelligence. We would then move into a new era of development unlike anything we have seen so far. But whatever may transpire in a post-singularity world, one thing is certain: The acceleration in the rate of development will not stop. Quite the opposite; it will leap upwards even steeper.

Herein lies our blind spot on the future. Continued acceleration is inevitable, and is winding us up faster and faster in a whirlwind of change from which there is no way out. Yet any notion of a long-term future for humanity implies the acceleration has ceased. You cannot have it both ways.

In addition, accelerating change puts ever-increasing stress on the systems involved—human, social, economic, and planetary. Stress stems from failure to adapt. And failure to adapt leads ultimately to breakdown of these systems.

Many of the crises facing us have arisen from accelerating development. Climate change, for example, stems from the fact we are burning fossil fuels thousands of times faster than the planet can reabsorb the CO<sub>2</sub> produced. And there are other equally dangerous crises waiting in the wings, each the failure to adapt to ever-increasing rates of change.

This new story is not, however, all one of doom and gloom. The impending end of our species in linear time does not preclude our fulfilling our destiny in exponential time. There could be as much development in the decades remaining as there has been in the whole of human history so far.

To explain how I have come to such conclusions, let us begin by exploring the nature of exponential change, and its counter-intuitive character.

## Exponential time

Five hundred years ago, there was little concept of progress. Time was measured cyclically—the cycles of days and nights, the moon, the seasons, the years, a lifetime. One generation lived and worked much as the previous generation. There may have been occasional innovations—a new horse harness, sturdier buildings, better food preservation—but generally the cycles repeated year after year, with little change.

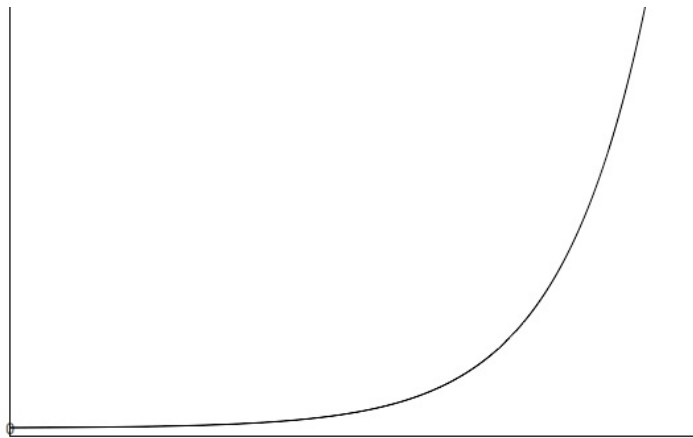
With the advent of the Renaissance, the European Enlightenment, and the Industrial Revolution, change came faster. People could remember the days of their childhood, before the printing press, the steam engine, or the automobile. Progress was now an intrinsic part of life. We looked back to how things were, and forward to how things would be. Cyclical time had given way to linear time.

Today, technological breakthroughs spread through society in years rather than centuries. Calculations that would have taken decades are now made in minutes. Communication that used to take months happens in seconds. Development in every area is happening more and more rapidly. We look back now, not just to how things have changed, but also to how much faster things are changing. Linear time has been overtaken by exponential time.

### The nature of exponential growth

Exponential growth occurs whenever the rate of growth is proportional to the current size. In everyday terms; the bigger something gets, the faster it grows.

A common example is population. The more people there are, the more children are born. The more children that are born, the more parents there will be in the future, and the more children that will be born, and so on. If there are no constraints, the population keeps growing faster and faster, resulting in the familiar exponential curve.

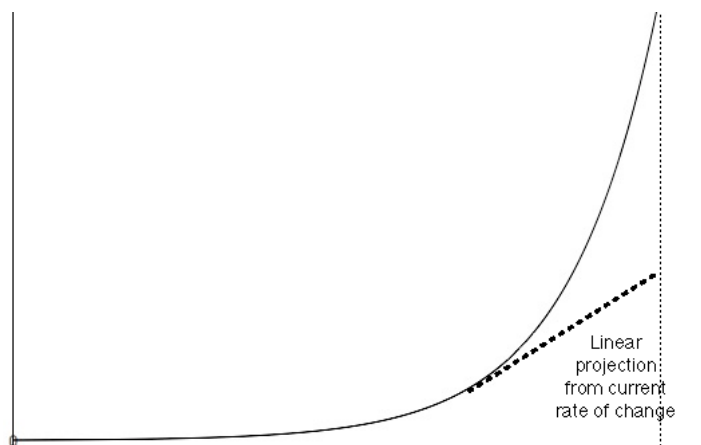


Population growth does not follow a true mathematical exponential curve, which is defined as one in which the rate of growth is directly proportional to the current size. Other factors like health care, sanitation and resources also have an impact. In what follows I shall use the term exponential growth to mean an exponential-like growth—one that has a similar character to the true mathematical curve.

Although we are all well aware of the accelerating pace of change in our own lives, we find it difficult to think in exponential terms. You may have heard the story of the king who was asked for one grain of rice on the first square of a chess board, two grains on the second, four on the third, doubling each time till the 64th square would have how many grains? A mindboggling 18,446,744,073,709,551,615, about 45 trillion tons, a heap as high as Mount Everest—far more than most people intuitively expect.

Money invested at compound interest is another good example. A dollar invested at 10% would be worth \$1.1 after one year; \$1.21 after two years; \$2.59 after ten years; \$117 after fifty years; \$13,781 after a hundred years; and around \$2.473,000 after a thousand years—which is about ten trillion times the weight of the Earth in gold. (This is why any economic system based on the charging of interest is destined to eventual collapse.)

In a similar way, we fail to see where exponential rates of change will take us. When we contemplate the future 25 years from now we usually extrapolate the current rate of progress into the future. If so much change has happened in the last 25 years, then we imagine a similar amount in the next 25 years. In reality, it will probably take only 10 years or so to witness a similar amount of change. On paper we can perhaps take the acceleration into account. But not in our imagination. Linear time still rules our minds.



## Accelerating Evolution

The acceleration we experience in our own lifetimes has a long history. Change may be occurring much faster today than it did a thousand years ago—medieval architecture and agriculture, for

instance, varied very little over the period of a century. But even then change occurred much faster than it did in prehistoric times—Stone Age tools remained unchanged for thousands of years.

Nor is this gathering pace confined to humanity; it is a pattern that stretches back through the history of life on Earth. Homo sapiens has been around for a million or so years. Mammals for more than fifty million years. Vertebrates with their central nervous systems, several hundred million years. Multicellular life a billion years. And simple cells nearly four billion years.

This acceleration in the rate of evolution is inevitable. It is a result of the same factors that lead population growth and money invested at compound interest to grow exponentially. The more progress there has been, the faster is future progress.

Take, for example, the emergence of sexual reproduction, some two billion years ago. Previously cells reproduced by splitting in two—into two clones of the original. With sexual reproduction, the genetic information from two cells was combined. Genetic differences now occurred in every generation, speeding evolution a thousand-fold.

Multi-cellular organisms were another great leap forward. Evolution was no longer limited to the creation of new types of cells—the muscle cells in a fish are not that different from those in you or me. New species could now evolve through reorganizing existing structures, which took much less time. The result was another speeding up of development. The awe-inspiring diversity of multi-cellular species that we see on Earth today evolved in just the last tenth of Earth's history.

### **What is accelerating?**

What do we mean when we say the rate of evolution has speeded up? Time has not speeded up. The Earth spins around the sun at the same speed. Clocks still tick at the same rate.

What has accelerated is the rate at which change has occurred—the rate at which new species have come into being, and the rate at which those species have evolved new characteristics. It is, to borrow a term from the philosopher Alfred North Whitehead, the rate of ingression of novelty into the world that is accelerating—the word “novelty” used here in its literal sense of “newness.”

Each evolutionary innovation—literally, “bringing in the new”—has spawned further innovation. Novelty arises faster and faster, and the rate of development accelerates. Simply put, innovation breeds innovation.

## **An Innovative Species**

With human beings an entirely new source of novelty emerged on the planet, and the rate of evolution entered a period of hyper-acceleration. If the whole of Earth's history were collapsed into one year, then human beings appeared in the last fifteen minutes, civilization thirty seconds ago, and the Information Revolution in the last half second.

This time, the leap in innovation lay with the human mind and hand, and our proficient use of tools. Tool use itself is not new; many animals use them in one way or another—crows that fashion a

piece of wire to hook out food, sea otters that use rocks to break open shellfish, chimpanzees using twigs to "fish" for termites, orangutans making whistles out of leaves.

Five million years ago, when our apelike ancestors were at a similar stage of development as today's primates, we would also have been using various tools. The only evidence that has survived over time is stone tools; those made from organic materials would have decayed and left no trace. But this does not mean our tool use began with stones; we've been tool-users all along.

Our tools took off with the advent of speech. Innovations did not die out with innovator, but could become part of the group's knowledge to be passed down to others. We began to build a collective body of knowledge about the world and use it to make better tools. And we began to use tools to create new tools, leading to the birth of technology.

Speech brought other benefits. Words allowed us to think about our experience. We could form concepts, apply reason, and better understand the world in which we found ourselves. Thinking also expanded our awareness of time from the immediate present into the past and future. We could recall previous experiences, and learn from them. And we could imagine future events, judge whether or not they might be beneficial, consider alternatives and their consequences, and make conscious choices.

Combine tool use with this newfound ability to communicate, think, reason and make choices, and you have a creature able to mold the clay of Mother Earth into a diversity of new forms. We learned to create edges to our stones, giving us axes, knives and arrowheads. We built shelters for ourselves and made clothes. We tamed fire, which not only kept us warm, we could cook food, and smelt metal. We developed agriculture, sowed seeds, and irrigated the land. We invented the wheel, developed new modes of transport, discovered new sources of energy, and created new materials. And we created better and better tools with which to do all these things, each development furthering future developments.

Our opposable thumbs, with their fine motor control, led to writing, allowing us to record the wealth of information we were gaining. And we did not stop at writing, we invented increasingly influential information technologies—from writing, to printing, telephone, radio, television, computers, and the Internet—each advancing our ability to share our experiences and accumulate the ever-growing body of knowledge that made so many of our technological advances possible.

We became a technologically-empowered intelligence, creating more effective ways to modify and control our world. And the more our technology developed, the faster it grew—that basic principle of exponential growth. Innovation bred further innovation, and the pace of change leapt forward at a dizzying rate.

## **Approaching a Singularity**

If there is any certainty about the future, it is that the pace of technological development, and with it the pace of life, will keep increasing. However fast things may seem today, the future is set to be much faster still.

Some futurists believe that ever-accelerating change will take us into a “singularity”. This is the term that mathematicians give to a point when equations break down and become meaningless. The North Pole, for example, is a simple geographic singularity: How do you go north from there? Or east or west? And which way is south?

The idea that there might be a singularity in human development was first put forward by the mathematician Vernor Vinge, and subsequently by myself in *The White Hole in Time / Waking Up In Time*. More recently it has been popularized by Ray Kurzweil, who argues that if computing power keeps doubling every eighteen months, as it has done for the last fifty years, then sometime in the late 2020s there will be computers that equal the human brain in performance and abilities. From there it is only a small step to computers that can surpass the human brain. These ultra-intelligent machines could then be used to design even more intelligent computers. And do so faster.

Kurzweil calls this point in time the "singularity." It is not a true mathematical singularity, in which the equations of physics break down; it's an "historical singularity" in which the patterns of the past no longer apply. With ultra-intelligent machines an entirely new form of innovation will have emerged; it will be a totally different game. And as to what happens beyond the singularity, all bets are off.

Nevertheless, there is one thing we can say about a post-singularity world. The rate of development will continue to accelerate. Indeed, the emergence of ultra-intelligent machines will undoubtedly lead to a further explosion in acceleration. Within decades of passing the technological singularity, rates of change will become astronomical.

In most post-singularity scenarios there is an implicit assumption that development will continue into the following centuries and beyond. Yet it is a fundamental tenet of singularity-proponents that ever-increasing rates of development are inevitable. We can't put precise figures to it, but if, say, there were to be as much change in the next twenty years as the previous fifty, then after the singularity as much change again might be likely in the following ten. And then as much change again in perhaps five years. Within a short time, the curve becomes impossibly steep.

To suppose that human (or human-cyber) development will continue into the centuries beyond is once again falling prey to our instinctive tendency to think in terms of linear time. When we consider things from the perspective of exponential time, our view of the human future is shaken to its core.

### **Our blind spot on the future**

When thinking about our long-term future, some foresee a human-cyber sci-fi reality, others a world struggling to survive the ravages of climate change, some an ecologically sustainable society of enlightened beings, others foresee our becoming part of an interstellar community. Yet whatever scenario, utopian or dystopian, people assume that, barring some cataclysm, the human species will continue, on this planet or another, for thousands or even millions of years.

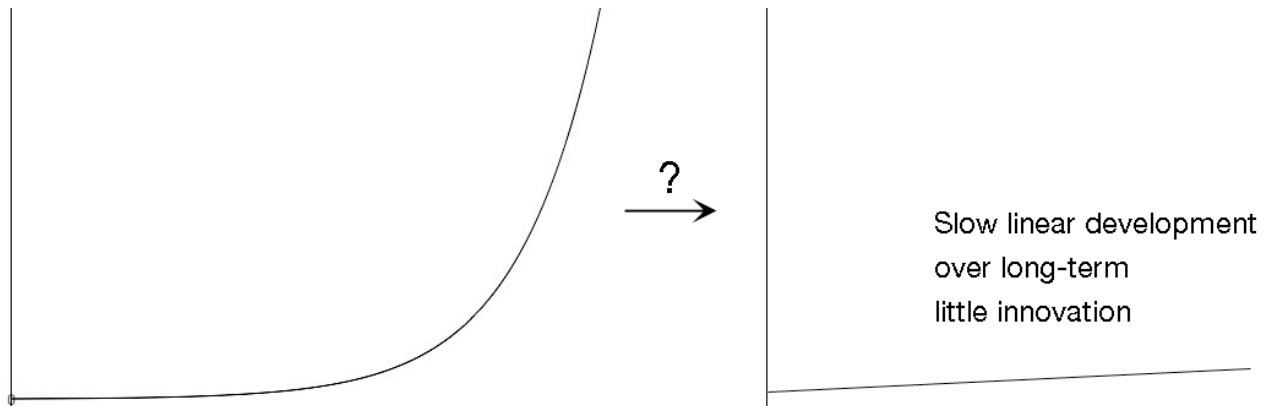
In imagining such futures there is the implicit assumption that rates of change are relatively static. Take the *Star Trek* scenario, for instance, set several hundred years from now. Technology on the *Enterprise* and back at Federation headquarters on Earth remains basically the same over time.

But how could that be? Would innovation, the driving force behind acceleration, have ceased? There is every reason to suppose that science and technology would still be developing fast. Indeed, given the exponential nature of accelerating change, the pace would have become unimaginably rapid long before the *Enterprise* was launched—and even more rapid in the years thereafter.

The same is true with just about every other long-term vision of humanity's future. They are not set within a context of accelerating change. In most cases, any development there might be is linear and slow, similar to pre-industrial times.

This is our bind spot on the future. By the end of this century the pace of development will be far, far greater than today's dizzying pace. In the century beyond it would be unimaginable. Hundreds of years beyond that, the curve would be off the charts. Like the growing mountain of grains of rice on the king's chessboard, it would be both way beyond our comprehension, and way beyond any feasible reality. On the other hand, when we imagine our species hundreds or thousands of years in the future, we make the implicit assumption that not only has the rate of change stopped accelerating, but any progress there might be is occurring relatively slowly. The two views of the future are inherently incompatible. You cannot have it both ways.

How does the natural exponential development turn into slow linear development?



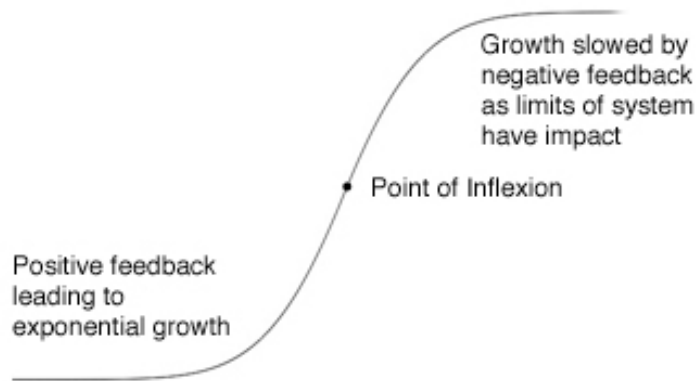
Thus anyone who imagines humanity hundreds of years from now must first explain how the acceleration of evolution, which has been going on since the dawn of life, will suddenly come to an end. All else is pie in the sky.

## Are There Limits to Exponential Growth?

When people begin to understand how ever-increasing rates of change preclude a long-term human future, they look for some reason why the acceleration will slow down, or even stop.

A frequent response is that no exponential process can continue forever. This is true. As any particular growth approaches its physical limits, negative feedback comes into play. The rate of growth slows and flattens out, producing a characteristic S-curve.

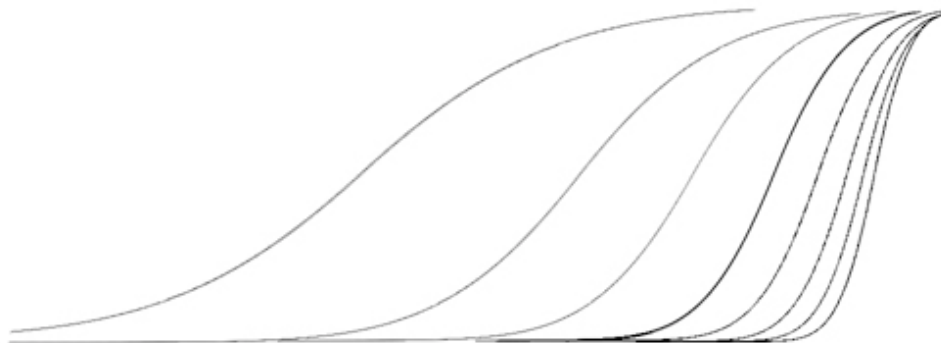




A simple example is bacteria growing in a dish. When the numbers are small, there are no effective limits to growth, and the cells multiply exponentially. Then, when they begin to fill the dish, there is less room for growth. The impending physical limits create negative feedback, which begins to hinder growth. Eventually, when the dish is full, the growth stops.

Recognizing that in practice, an exponential growth cannot go on forever, people assume that we will follow the same pattern, and the rate of development will slow and eventually flatten out.

There may well be limits to the rate of growth in any particular arena. Population, energy consumption, or urban expansion may each reach a limit and flatten out. However, what we are considering here is not just the rate of growth in any particular arena—such as population growth, oil consumption, or Moore's Law in computing—but the overall acceleration in the rate of change. The S-curves are getting steeper and coming faster.



### Is there an S-curve to evolution itself?

Another possibility is that there may be an S-curve to the overall rate of change. This would happen if there were limits to how fast change could occur. Such limits may well exist. But they would be limits to the rate of change itself—limits as to how much change the various human, social, and planetary systems could tolerate. As we approached those limits, the acceleration would begin to slow down and eventually stabilize.

However, approaching such a limit would not mean that the rate of change itself would stop. It would be the acceleration in the rate of change that reached a limit, not the rate itself—a point that many people fail to grasp. Change would continue happening very fast—at the maximum possible rate. Imagine a steadily accelerating car; eventually it reaches its maximum speed and the acceleration stops, but not the car, which is still traveling at top speed. Similarly, even if the pace of change leveled off, we would still be living in an ultra-fast world. Hardly a sustainable limit.

## **Changing Course**

Some argue that future technologies will free us from the need for material consumption. But it is not just a question curtailing this particular area of growth. Even if material growth were to slow to sustainable levels, innovation would not come to an end, nor would our development; it would simply move on into other arenas. We would find ourselves on a new, and even steeper, curve—one that may be as far beyond our imagination today as the Internet would have been to Galileo.

Others argue that the global crisis stems from a limited, ego-centric, materialist mode of thinking, which has led us to misuse science and technology in the service of greed, power and control. A shift in consciousness could lead to a new ethics focused on the good of the whole rather than that of the individual, helping us create a more equitable and sustainable world.

It is most unlikely that that such a shift would ever be enjoyed by more than a select few; however, just suppose this scenario were to come true, would we then stop developing? Would the rate of change slow down to a comfortable, manageable pace? On the contrary, there is every reason to believe that innovation would continue. We might choose to apply our creative capacities in more sustainable ways, but the acceleration would not end. Innovation would still be breeding innovation. The rate of ingression of novelty into the world would still be increasing. We would still be spinning faster and faster towards untenable rates of change.

## **The Stress of Acceleration**

Singularity-proponents tend to focus their attention on the wondrous new technologies on the horizon: self-reproducing and self-repairing machines, human-cybernetic interfaces, brain enhancement, nano-tech medicine, DNA technology, reversed aging, 3D printed organs, etc. Entranced by the awe-inspiring promises of ever-more rapid technological development, they by-and-large fail to consider the downside of this acceleration, namely the stress it is putting on all the systems involved.

Stress is often defined as a failure to adapt to change. The more we have to attend to, plan for, worry about, and take care of—the more changes to which we have to adapt—the more likely we are to suffer stress, with its various negative consequences in terms of physical, mental, and emotional health, and its repercussions on family, friends, and colleagues.

Today the increasing pace of life and the demands of new technologies are becoming a growing stress. Many are finding themselves having to work longer hours, even weekends. In addition, there are new technologies to learn, more systems to upgrade, more information to keep abreast

of, more time consumed on social media. The amount of quality time we can have with ourselves, family and friends, relaxing and recovering from the pressures of work is getting less and less, for some disappearing completely. As adaption to increasing change becomes harder and harder, exhaustion and burnout will become increasingly common.

But it is not only the people who are experiencing the stress of ever-faster change. Our social, economic, energy and environment systems are all being impacted as they fail to adapt to increasing change.

## **A crisis of acceleration**

The crisis we are facing is, in essence, a crisis of acceleration.

Clearly the human population explosion is the result of exponential-like growth. Thankfully, it is beginning to tail off, nevertheless the implications for food, water, housing, geo-politics, and other issues are major and growing.

Oil reserves are running out because we are now consuming it a million times faster than it was created. Similarly with many other resources whose supply is becoming critical—platinum, copper, zinc, nickel, and phosphorus, all of which are crucial for contemporary technology—will have run out, or be very limited, within a few decades. Yet our demand for them continues to grow, especially with the rapidly growing needs of developing countries.

On the other side of the equation, rapid growth in industrialization has led to an accelerating growth in the release of pollutants into the air, soil and sea. And they are being released thousands, or in some cases millions, of times faster than the planet can break them down and absorb them. Climate change, for instance stems from our accelerating consumption of fossil fuels and the accompanying increased emission of carbon dioxide into the atmosphere. Normally the CO<sub>2</sub> is absorbed by plants and the oceans, but we are now producing it hundreds of times faster than these systems can handle. We might (if we really put our hearts and minds to it) avert the most damaging repercussions of climate change; but climate change is just one potential catastrophe. There are many others waiting in the wings.

I've already mentioned the inherent instability of any economic system based on compound interest. Another direct consequence of such systems is the need for continual growth in net wealth in order that the interest be repaid. A three-percent annual growth may be deemed healthy for a nation, but the impact on the planet of such growth, compounded over a hundred years, is devastating.

The acceleration has also promoted geo-political instability. Europe spearheaded the acceleration in scientific, technological, and cultural development. It then colonized other lands whose development in these areas was perhaps a thousand or more years behind. The dangerous consequences of this are now apparent in regions of the world that are still living with medieval customs and values, yet have access to modern weaponry, internet, and ease of travel. We are seeing not so much a clash of cultures, but a clash of eras—a clash originating in a mismatch in rates of development.

A system can only tolerate so much stress; then it breaks down. If a wheel is made to spin faster and faster, it will eventually break apart under the stress. In a similar way as rates of change get ever faster the systems involved will reach a point where they too break apart. Whether it be our own biological system, social, economic, and political systems, or the planetary ecosystem, the stress of ever-increasing change will eventually lead to breakdown. Crises will pile upon each other faster and faster, heading us into the perfect global storm.

## **The great unraveling**

Predicting the actual course of events is never easy. Nevertheless current trends point to some likely scenarios.

Climate will undoubtedly be a major factor. Scientists are now concerned that climate change may have reached a tipping point. Even if we were to stop all fossil-fuel burning today, global temperatures would continue to rise for decades, probably triggering a runaway greenhouse effect as the much more potent greenhouse gas methane is released from the tundra and deep ocean. The warmer the planet gets, the more methane is released, and the more the planet warms—the familiar positive feedback loop that underlies exponential growth.

The effects of climate change on the world's ecosystems will be profound, which will have a major impact on human civilization. As drought and heat turn large areas of arable land into desert, there will be widespread crop failures and famine like we have never seen before. In some regions, fresh water will become increasingly scarce, not only from drought but also from rising sea waters entering the water table. Increasingly severe storms and their aftermath will take a growing toll on human life. Prolonged extreme heat waves in regions with little water or air-conditioning would be devastating. Impoverished conditions will also increase the risks of failed states, providing fertile ground for conflict and terrorism. Mass-migrations will occur as millions seek to escape to places where they can survive, bringing major challenges for the regions to which people are fleeing. And it is not just the weaker states that will be affected. Sustained drought, food shortages, and other ramifications of climate change could provoke widespread public unrest in the developed nations.

Other crises, such as economic collapse, energy shortages and unprecedented natural disasters, could lead to widespread social breakdown and the rise of police states. Global conflicts will increase as food, water and other resources become increasingly scarce. Nuclear war remains a distinct possibility. Epidemics of drug-resistant bacteria, uncontrollable wild fires, biological and chemical terrorism, collapse of the Internet through hacking or cyber-war, increasing systemic chaos—all are possible. Doubtless some will happen.

And, more than likely, completely unforeseen events will take their toll.

## **Proliferating problems**

Some people hope that we will be able to solve, or at least alleviate, the many problems descending upon us. After all we are an innovative species, and in the past have successfully applied ourselves to solving our problems. Could we not also apply ourselves to tackling the new problems now facing us?

But this is not as straightforward as it might at first appear. We are facing what the Club of Rome in its prophetic 1970s report, *Limits to Growth*, called "a global problematique"—a complex interdependent set of problems. Climate, over-consumption, food and water shortages, pollution, resources, banking, terrorism, mass-migration, disease all interact. A tremor in one can ripple through the others—a devastating hurricane shakes the insurance industry, impacting the stock market, investment, government and social order. The problems need to be solved together; a Herculean task, even if it were possible.

Moreover, our past attempts to solve major problems often left bigger problems in their wake. The movement into towns and cities helped solve problems of supply and the division of labor. But new laws and administration were required to keep order in the cities. And dealing with those who transgressed the laws created other problems. The more developed nations solved some of their supply problems by gathering resources from across the world, but this led to further social and political problems. Energy constraints were solved by burning fossil fuels. The unforeseen problems that this "solution" created are now plain for all to see. Now there is talk of geo-engineering to solve the climate problem; but what unforeseen, and even greater, problems might that create?

Meanwhile, forests are dying fast, to be replaced by concrete, wasteland, and desert. Species are becoming extinct as fast as in any of the great planetary cataclysms of the past. The air is toxic. Topsoil is blowing in the wind. Rivers run sour into the sea. The oceans are turning acidic. The once rich coral reefs are dying.

And the geopolitical ramifications are also building up. As I write, the recent US election is sending quivers across the world. Brexit has shaken the foundations of the EU. The European refugee crisis is a portent of bigger migrations to come. There is the pain and tragedy of the ongoing war in Syria. The fear induced by the rise of ISIS. The growing severity of internet hacks and cyber-war. They are all coming faster and faster.

We are witnessing the beginning of the great unraveling. The growing troubles filling the daily news merely reflect what it is like to be a technologically-empowered species spinning ever-faster into the eye of its evolutionary spiral.

## **No blame**

When we look at the many crises now facing us, and the very real possibility of our species coming to an end, we may ask when and how we fell from grace?

Some see it in the European Enlightenment of the eighteenth century when human activities took precedence over nature. Others in the Industrial Revolution, which triggered our burgeoning consumption of natural resources with its consequent pollution, and the ensuing revolutions in sanitation and health care that led to rapid population growth. Some see it in the oppression of indigenous cultures by colonialism. Or the legalization of usury and the charging of interest, leading to economies wedded to continual growth. Some see it in the advent of civilization and the movement away from the land to living in cities. Others in the demise of matriarchal societies and the patriarchal takeover of our culture. Or in the loss of our indigenous myths and initiation rites. Some trace it back to the emergence of agriculture, when we moved from a hunter-gatherer

lifestyle based on coexistence with nature to one in which the world was ours to control and exploit. While others argue that the root of the problem goes back even further, to hunting itself. Is it a coincidence, they ask, that many of the large mammals disappeared from the planet around the same time as humans developed the spear?

All of these undoubtedly played a role in our present-day woes. But it would be wrong to put the blame on any one of them. Our intention has always been to improve the quality of life. We have sought to free ourselves from pain and suffering, to live longer, healthier and more fulfilling lives. And there can be no blame for that.

It is natural that any intelligent tool-using species will seek to improve its lot in life and enhance its safety and survival. And natural that it would apply its ability to learn, to think about its experience, and to make choices, to its own benefit. It is equally natural to develop the knowledge and technologies that allow it to do this more effectively and efficiently. And as innovation built upon innovation, our techno-cultural development would inevitably have leapt ahead into a phase of hyper-acceleration, with all its unseen consequences.

In the final analysis, it is this hyper-acceleration that is intrinsically unsustainable. But unfortunately, there is very little we can do about that.

We might liken our situation to water whirling towards the plughole in a sink—something most of us have watched from time to time. Far from the center, the water is moving slowly, almost imperceptibly, perhaps taking a minute to complete a revolution. Halfway to the center, it is moving four times as fast, taking 15 seconds per revolution. Halve that distance and it is moving four times as fast again, a revolution every four seconds. Halve that, and its whirling around once per second. The closer we get the faster it whirls, until it is sucked down the center of the spiral.

Humanity is whirling faster and faster on its own spiral of change. And, just as the ever-more rapid whirling of the water comes to an end when it reaches the center of its vortex, the hyper-acceleration in the pace of our development will come to its own end. But it will not end because we change our ways, or get innovation under control. It will come to an end as we spiral into the center of our temporal whirlpool—a time we inevitably started heading toward as soon as the power of innovation was put in our own hands.

## **Across the Universe**

The physicist Enrico Fermi pondered the apparent contradiction between a high probability of extraterrestrial civilizations existing elsewhere in our galaxy, and the lack of evidence for, or contact with, such civilizations. Why haven't they already colonized Earth? Or why don't we detect their radio transmissions?

Many answers have been proposed, ranging from the possibility that they are already here, to the possibility that the distances are so vast why would they bother. But the true answer may be that they don't exist. Or to be more precise, they exist only for a relatively short time.

Whatever their physical form, any intelligent tool-using species is likely to develop technologies that enhance their well-being. And the more they develop, the faster they will grow, resulting once again

in exponential growth. Whatever form their technology might take; within a short time (evolutionarily speaking) they will be meeting the consequences of their own hyper-acceleration, moving ever faster towards the center of their own evolutionary spiral.

Marvelous as they may be in their moment of glory, it may be that intelligent technologically-empowered species exist only for a brief flash in cosmic time.

On the other hand, there may well be advanced intelligences that have not taken the technological path. Here on Earth, whales and dolphins show signs of intelligence approaching that of humans, and at times of great caring that may surpass our own. However, having no hands, they have not developed tools and technology, so have not been subject to accelerating change.

Perhaps the evolution of intelligence has taken a similar, non-technological, course on other planets. More advanced intelligence may be living in a planet's oceans (whether they be oceans of water, methane, or some other liquid). There a creature's body is free from the constraints of gravity, and can grow much larger than on land, opening the possibility for much larger brains. It may be there, in the extra-terrestrial oceans that intelligence and awareness far surpassing our own has evolved.

## **A Cosmic Bud**

However, even though a technological civilization such ours may exist but for a brief period, all is not lost. Far from it.

On some of the trillions of planets across the Universe life will have appeared, and on some of those evolved into a rich diversity of species. From time to time one of those species takes the step into language and tools. A bud of self-awareness has appeared. And it appears quite suddenly.

On our planet it was preceded by billions of years of slow cellular evolution. Then by hundreds of millions of years of vertebrate evolution; then by millions of years of mammalian evolution; and then, almost out of nowhere, our tool-using ancestors appeared. With the advent of speech, the bud grew rapidly, at an accelerating pace. Within a short time, cosmically speaking, it started to bloom, bursting into an exotic, multifaceted cultural inflorescence. Billions of self-aware petals, seeking to become all they can be; to know all there is to know.

When a planet bursts into bud, knowledge takes off on its own accelerating curve. We have learnt as much about the physical world in the last fifty years as we did in the previous five thousand. And we may learn as much again in the decades ahead. Physics is approaching a "theory of everything"—a set of mathematical equations that underlie all the forces of nature. We are not there yet, but many believe the breakthrough could happen any time. In cosmology we are beginning to understand how the Universe came into being, and where it might be headed. Again, we are not there yet—there remain many unanswered questions, and almost as many competing theories—but discoveries in this field are coming fast. Similarly with life itself, progress in molecular biology is proceeding at such a rate that we may come to a full understanding of life in coming years.

However, knowledge of the physical universe is but half of what there is to know. We are also conscious creatures, and as significant as all our scientific, technological, and cultural

developments may be, of no less significance is our having become self-aware. We are not only aware of our experience, we are aware that we are aware. And no knowledge of the cosmos could ever be said to be complete if it did not include a full knowledge of awareness itself, without which nothing would be known. Today the interest in knowing consciousness itself is rapidly growing, both scientifically and on a personal level.

Our species may be gone in a century or so, but that does not mean it is all for nothing. Quite the opposite. We may have little future in terms of linear time, but in exponential time so much more is possible. In the coming decades there may be as much development as has happened in the whole of human history. Or perhaps even more. Within the short linear time remaining for our species we may yet come to a complete knowing of the world, both around us and within us. This does not mean knowing everything it is possible to know, but everything this particular intelligence could know in this biological form, from this point in the universe.

Another bud of consciousness will have blossomed.

## **Accepting the Inevitable**

We've always known human beings could not last forever, but most of us have imagined the eventual end to be some time way off in the future. We don't like to consider that our end may be just a few generations away.

There are obvious parallels here with our own death. We know it is coming, but unless we have some terminal illness or suffer a potentially mortal injury, we tend to push it away to some time in the future—not tomorrow. Yet accepting our own mortality is part of being a mature human being. Indeed, confronting death directly can produce profound shifts of consciousness. People may reconsider what is really important, value love more than wealth, seek to make amends for past misdeeds, and perhaps find a renewed purpose in life.

The same may apply to humanity. Previously, we were not forced to conclude that homo sapiens might be coming to an end a lot sooner than we anticipated. Accepting the mortality of our species could be a collective coming of age. It may be just what we need to guide us through the coming times.

## **Planetary Grief**

Our attachment to the continuation of our species is quite natural. It is who we are. And quite appropriate that we should love who we are and want us to continue. But how do we include within that the growing realization that our end may be coming much sooner than expected?

This will come to a head as the reality of the unraveling hits home. There will undoubtedly be widespread despair, depression and distress. There will be pain, remorse and grief over what has become of us, this wondrous, creative, intelligent species, and of this beautiful planet with its awe-inspiring diversity of life. And there will be much fear and anguish about how our own lives will unfold as we head into the eye of the coming storm of change.



How will we each deal with such pain and grief? Will we go into denial, refusing to accept what is happening? Lose ourselves in panic and terror? Or find the acceptance that allows us to move into the unknown with courage and an open heart?

With the sudden death of a loved one, there are recognizable stages to grief. The first is denial. We cannot believe he or she has passed, and is no longer with us. It can't be true. Then comes anger. Whether directed towards God, a physician, an illness, a circumstance, or some other agency, How dare this happen? It is not what I wanted. Third may come bargaining. We want our loved one restored. If only I had just done this or that. Maybe even now I can make some deal to bring the person back. This is often followed by depression. We may withdraw from life, consumed by sadness, wondering if there is any point in going on alone? Finally comes acceptance. It is accepting the reality that our loved one is physically gone. We may not like this new reality, but we adjust and learn to live with it.

Humanity will undoubtedly enter its own collective grieving as the writing on the wall becomes more apparent.

Clearly we are already in denial, whether it be climate denial, denial of the poverty in which one third of us live, denial of the fragility of civilization.

Those who've woken up from denial may move into anger; anger at the corporations, the politicians, the wealthy, the church, the military, the terrorists, or anyone else we blame for the crisis we are in.

There are already signs of the bargaining phase. If we just changed our ways perhaps we could make things OK again, rescue ourselves from the tragedies that lie ahead. Perhaps it is not too late to clean up our act and save the world.

Then will surely come depression. What have we done? This is terrible. The future looks so bleak, There will deep sadness at what has befallen us.

Finally—hopefully—there will come acceptance. We let go of our attachment to how things should be, our hope that things will turn out well in the end, and accept this is now the way things are. We don't deny the painful emotions that may arise, but accept them as part of living through these times. We adjust to the new situation and perhaps find a deeper meaning to life.

## **Species' Extinction**

It is becoming apparent that we are likely witnessing the start of a sixth major species extinction in Earth's history, one triggered this time not by a comet strike or volcanic eruptions, but by one of the planet's own species. It may be that a significant proportion of Earth's species again become extinct. Most, if not all, the larger animals (including us) would die out. But it is very unlikely to mean the end of life on Earth. Life itself is much more resilient. New species would evolve, and a million years from now the planet would flourish again.

It is also possible that it may not be so severe. Some people might survive, perhaps eking out an existence in the newly-green polar regions, or possibly in some contemporary arks—self-sufficient, sustainable, high-tech habitats created by the wealthy to ensure their survival in the final days. If

they are lucky, they might even be able to survive long-term. Humanity would not have become extinct after all.

But we would still be an innovative species. We would still be seeking to improve our lot—which in such a future might not be a very happy lot. As before, we would find ways to survive better and more comfortably. And the positive feedback of innovation breeding innovation would still be operating. Slowly but surely, the spiral of acceleration would begin to wind itself up again, and slowly but surely we'd eventually approach a similar point in time. Once started, there is no way off the exponential curve.

Even if some indigenous people survived, the ultimate fate would be the same. It is true that indigenous peoples today generally live in harmony with their environment. But remember that we in the developed world are the descendants of indigenous peoples. Today's twenty-first century culture is simply what happens to an indigenous culture as technology takes hold. The Yamamani of the Brazilian rainforest are just ten thousand years behind us.

Extinction often conjures the notion of us all being wiped out in some global catastrophe. This is of course possible. But species generally become extinct as their habitat becomes increasingly inhospitable. Their numbers begin to decline, until eventually there are only a few left; then none. Similarly, as the great unraveling takes hold, and our world becomes less and less hospitable, our numbers will start going into decline. In T.S. Elliot's words, it will end "not with a bang but a whimper."

### **What to do?**

The question then naturally arises: How do we spend our final days? How do we as members of an intelligent, self-aware species, choose to spend our lives, knowing that our species will not be around much longer?

Do we party madly, consuming to the last drop of oil? Or bury our heads in depression and hopelessness?

For me, acceptance of the situation has brought with it some surprising shifts in attitude. I am not so angry at the people whose views and actions I disagree with. I am no longer such an avid follower of the news, getting upset by the latest political shenanigans, economic swings, or social unrest. This is simply how it is to be living through the final generations of an intelligent, technological species. There is no blame to be apportioned. Instead I can be more understanding, more forgiving.

Accepting the end is nigh does not mean that I no longer care for the world around me. I still want to do what I can to preserve the planet, but now I want to do so for the planet's own sake. Perhaps the best we can do with our remaining years is to make sure we leave the Earth in as good a state as possible for the species that remain and those that may follow.

We will also need to take care of our fellow beings who will be in need of help and support—providing basics such as food, water, shelter, medicine. And there will be much needed emotional and mental support—care, comfort, compassion, coping with the fear and pain, and adapting to changing situations.

Greater flexibility will be important, in our thinking as much as anything. We need to be able to let go of outdated thinking and habitual reactions; to see things with fresh eyes and respond appropriately. And we will need personal stability. We don't want to be thrown into fear and panic whenever we meet the unexpected.

Strong community will be valuable. The future is uncharted territory; we will feel vulnerable at times, and in need of emotional support. In community we can build the material, psychological, and social resiliency that will help us navigate the coming times.

### **Exiting with grace**

We are wondrous beings, with unique gifts and abilities. We are capable of love and deep compassion, an appreciation of beauty, the creation of great art, music, and poetry. We are aware of our history, of how we came to be here. We have studied the world around us, and been awed by what we have discovered. We can imagine the future and choose how to respond. We find meaning in our lives, a sense of justice, and an inner wisdom.

There is much to celebrate about us. The question is: Can we celebrate all that we have become, while accepting that we are here only for a brief flash of cosmic time? A friend reminds me of the so-called century plant that flowers once in 20 or so years. When it does finally bloom, we marvel at the giant stalk, holding high a magnificent array of yellow-flowered branches. The spectacle is made all the more awesome by the knowing that it flowers but once; then dies, its purpose complete. Can we celebrate ourselves in a similar light? Another blossoming in the cosmos. An exquisitely beautiful flowering of consciousness. A miracle of creation.

Can we let go of the cherished belief that we are here to stay, rejoice in our existence, and live our final days with grace?

Despite knowing the journey, and where it leads, I embrace it and welcome every moment.

~ Louise Banks in "Arrival"