Not Everyone Will End Up with an Axe in the Forest

Tools for a Better Life in a Chaotic World

Bruno Marion

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To all the young people who have adopted me,
Alexandre, Eliott, Kai, Maria, Parker, Valentin,
and to all the young people who build
a better world.

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INTRODUCTION

Why the world has become more uncertain... and why that's good news!

"The problem with our times is that the future isn't what it used to be."
Paul Valéry

The world is in crisis... At least, that's what we hear every day on TV, on the radio, in the newspapers, on social networks or from friends!

But while everyone's talking about possible crises and probable collapse, few are talking about possible opportunities and probable emergence. The new world and how to get there. That's what this book is all about.

One day, at the end of an interview, the journalist from a major national radio station asked me: "If there was only one thing to do to prevent the world from collapsing, what would it be?" After a few seconds of thought (and doubt about my ability to answer such a question...), I answer her what then seems obvious to me: "Say hello to your neighbor every day. Really, every day." Like her, aren't you convinced that a small action can change the world? I don't blame you, I've had my doubts too. The aim of this book is to show you that, paradoxically, in this world where everything has become more

uncertain and chaotic, you've never had so much power over your own life.

This book aims to show you why and how we're going through a genuine metamorphosis of a scale and speed unprecedented in human history... and that this can be good news. It shares a new, accessible, immediately applicable model that will enable you to navigate uncertainty, be more resilient and even take advantage of crises!

We will look at why and how our world has become more uncertain, what practical tools you need to surf the tsunami of change, and above all, why you've never had so much power to make your dreams come true. This book won't just help you understand the future, it will give you the tools you need to build the future you want for yourself, for our organizations, for the world we leave to our children... and so that we don't all end up with an axe at the bottom of the forest.

Why numbers, connection and speed have made our world more uncertain

When I meet someone who asks me what I do for a living (we'll see in the 3rd chapter of this book that it's important to know how to answer this type of question to help others... to help you), I usually reply: "My mission is to convince people who aren't yet convinced that we (humans) are living through a transition unprecedented in human history. And that this transition can be good news if we understand it." My mission is also to find and share the tools to surf the tsunami of changes we are going through and will continue to go through and leave a better world to our children."

I readily admit that it's a bit ambitious... even pretentious! And most of the time, my interlocutors are quick to remind me that not only is it ambitious, it's also pointless! So, one of the objections I hear most often is: "You think this is an exceptional time, that we're living through an incredible transition, because it's YOUR time. 100 years ago, or 1,000 years ago, or 10,000 years ago, humans must also have thought they were living in incredible times!" Objections that take different forms, but that can be summed up as: that's the way it was before! If someone says that to you, I invite you to tell him or her that he or she is right! Because, of course, our ancestors have lived through transitions, crises, wars, chosen or forced migrations and (already!)

pandemics. And of course, nature and the living world have always presented chaotic aspects. The difference with our transition can be summed up in three words: numbers, connection and speed.

NUMBERS

How many people were on Earth 150 years ago? About a billion. How many are we today? Over eight billion. Over the last few years, in just a few generations, the population has grown at an incredible rate. In fact, we're talking about a veritable explosion! If our ancestors lived in a relatively empty world, we live in a very, very full one! A world that's full and, as we shall see, highly connected.

The global population explosion

THE CONNECTION

On August 4, 1938, an expedition from the American Museum of Natural History on an exploratory mission in search of new bird species in New Guinea was to change human history. Entering the Great Balim River Valley, then thought to be uninhabited, they discovered a population of over 50,000 people! Richard Archbold's expedition was to achieve what may well have been the last *first encounter*. For one of the last times in the history of mankind, it was to

bring together men and women who were unaware of the existence of other men and women elsewhere on Earth! This is unlikely to happen again today...

Humans are increasingly rubbing shoulders and meeting each other. And our frustration at not being able to do so was brutally exposed during what we'll call *the confinement period*. Humans are also communicating more and more:

- more than half of the human population has access to the Internet, increasingly via a smartphone;
- there are more cell phones on Earth than human beings since 2014! More people on Earth have a cell phone than have a bank account, or access to drinking water or a toilet.

I've noticed that not only are we communicating more and more, but we're also more and more aware of belonging to a human community.

One evening in August 1997, I was driving home from dinner with a friend who was living on a barge on the Seine near the Bir-Hakeim bridge in Paris. On the quays of the right bank, we reached the Alma tunnel: impossible to use, as it was closed. We then watch the chase between a policeman trying to tackle, rugby-style, what appears to be a journalist, or at least someone with many cameras. As we reach the other side of the tunnel, we see dozens of police, fire and ambulance vehicles with their lights on. Gas leak? A terrorist attack? Actually, a car accident in a Paris tunnel. For those of you who haven't watched television in over twenty years, Princess Diana had just died.

Some time later, an estimated 2.5 billion people in over 190 countries watched Lady Di's funeral on television in 44 languages. This represented 40% of humanity at the time. Even if other estimates are much lower, counting only 500 million viewers, this would still be one of the most watched events on television! So, an unprecedented number of people in human history gathered around the disappearance of a woman they had never met, as if she were one of their neighbors or a member of their family...

Six degrees of separation

You may have heard the term "six degrees of separation". The idea is that every person in the world is connected to every other person by fewer than six social connections. Researchers tested this in the 1960s and found it to be pretty much true.

In the age of social media, one would assume that since we all know so many more people from so many different parts of the world, there would be fewer connections between any two random people. Who better to analyze this than Facebook? After analyzing 721 million people and their connections, Facebook discovered that in 2016, on average, two people in the world are separated by 3.57 people. So we can now speak of "three point fifty-seven degrees of separation"...

(https://research.facebook.com/blog/2016/02/three-and-a-half-degrees-of-separation/)

On December 26, 2004, I was in India on the road between Chennai and Pondicherry when a journalist from a major all-news french radio station called me from Paris on my French cell phone, unaware that I was in India, to ask my opinion of the *situation*. That's how I learned that I was in the part of India most affected by the tsunami, which claimed 225,000 lives and left millions homeless in Asia.

Within hours, thousands of videos had already been posted on the Internet, triggering an outpouring of emotion and solidarity never before seen in human history. Never before had so many people come to the aid of people they had never met**.**

Could this unprecedented outpouring of generosity be a sign that humanity has begun to realize its own dimension on a planetary scale? Is it a sign of what we call an "emergence", which I'm going to tell you about in a few lines?

In short, remember that there have never been so many of us on Earth, and we've never been so connected to each other! As David Ruelle, one of the first scientists to talk about chaos theories, writes: "The more oscillators [that's what he calls the different elements of a system] and the more interconnections between them, the more we should be ready to see chaos."

SCALE AND SPEED

Why is the transition we're going through unlike any previously experienced by Humanity? The answer is scale and speed. No other transition affecting humanity has affected so many people on Earth in such a short space of time.

A more connected world that is also moving faster and faster:

- the evolution of the lithosphere (the mineral) is counted in billions of years;
- the evolution of the biosphere (living organisms) is measured in millions of years;
- the evolution of the noosphere (information) is counted in nanoseconds!

At the very level of human history, if it took thousands of years for man to move from the hunting-gathering era to the farming-breeding era, and hundreds of years to move into the industrial-commercial era, it's only a few decades that have brought us to the era we'll call the creative-communication, information or knowledge era.

And, very importantly, the major transitions from hunting and gathering to agriculture and livestock, and from agriculture and livestock to industry and trade, did not affect everyone at the same time. These transitions were spread out over time and geographically.

Most of today's technological, social and economic revolutions are taking place within a single generation. Human beings and cultures no longer have the time to adapt smoothly. For example, our grandparents were born, worked and died near the same geographical location, whereas the probability of being born, working and dying in the same place is now almost nil for most of us! Similarly, the 1,000 words of common language that our parents learned were, with a few exceptions, the same 1,000 words they used at the end of their lives. The 1,000 words you most commonly use are already a far cry from those you learned when you were younger. Not so long ago, you weren't downloading, chatting, tweeting, podcasting, posting, zooming or e-mailing much either...

We no longer speak the same language!

Even our language is changing faster and faster. From one generation to the next, we no longer understand each other! Since Richelieu, the Académie française has published a dictionary as a reference approximately every twenty years. In previous centuries, the difference between two publications was around 4,000 to 5,000 words, a figure that has remained more or less constant; between the previous one and the next, it will be around 30,000. At this rate, we can guess that our successors could soon find themselves as separated from our language as we are from the old French spoken centuries ago..

Thirty years ago, I used the first cell phone. It was the size of a small suitcase...

The transition we've been experiencing for the past few decades is affecting almost everyone at the same time! Today's technological, social and economic revolutions are taking place over two or even just one generation. No technological revolution has affected so many human beings in such a short space of time!

And that changes everything...

The human world speeds up

In 2020, I return to France from Thailand on March 16... the day before the lockdown. Just enough time to reach my resilient home and my little family in the South of France. Many of the friends, clients and journalists I've met in the past then remember that I've been working on uncertainty and crisis management for over twenty years. And they all ask me for advice. Many of the people I talk to also ask, "Don't you think this is all just *a little flu?*" And many make comparisons with the Spanish flu, or even older pandemics that were even more deadly. Obviously, I couldn't comment on the seriousness of the new disease. Unlike many people at the time, I hadn't certified myself as an epidemiologist after reading three Facebook articles and watching two YouTube videos... However, it was already clear to me that the consequences would go beyond those of a simple flu.

By the end of March, a few hundred thousand deaths had been attributed to Covid (then known as coronavirus), perhaps more in reality. By the end of April, just a few weeks later, more than half the

human population was under some form of confinement. More than 4 billion people saw their daily, professional and family lives radically changed in just a few weeks! Many people still say to me: "It's the media's fault", "It's social networks' fault", "It's the evolution of our relationship with death's fault", and so on. This may be true... but it's also missing out on an incredible phenomenon: in the space of a few weeks, the daily lives of several billion human beings have been significantly impacted. Even during the two world wars a large proportion of human beings weren't even aware that these wars were taking place on the other side of the planet. Similarly, with the Spanish flu, it took decades to realize the impact and death of 50 to 100 million people. At the time, people weren't aware of the catastrophe, but unlike Covid, the Spanish flu didn't impact half the world's population in a matter of weeks. The number of cases was not tracked daily on Twitter or Facebook...

The scale and speed of Covid's impact on the human population is a perfect example of the butterfly effect or self-amplification described in chaos theories, and which we will learn to use to our advantage in the third chapter of this book.

So yes, certain aspects of human life are speeding up. If an Italian peasant from 1300 could find himself in Tuscany in the 1870s, thanks to a time machine, he wouldn't notice many differences... Conversely, if you knew China thirty years ago and went back there today, I can assure you that you wouldn't recognize anything.

Added to all this acceleration is the incredible friction between things that evolve very quickly and things that cannot evolve very quickly (for the time being?):

- it still takes about nine months to make a child;
- it still takes between fifteen and twenty-five years to make an adult;
- it still takes a season to grow certain fruits and vegetables;
- it takes several years for a fruit tree to start producing fruit;
- Even if we were to immediately and completely halt our CO_2 emissions, it would take thousands of years to dissipate the CO_2 produced over the last three hundred years.

So, I think it's safe to say that we're going through a transition, or rather several transitions, on a scale and at a speed never before seen in human history. Because there have never been so many of us on Earth, because we have never been so interconnected, and because a number of phenomena are accelerating, we are experiencing an unprecedented transition.

Has the world gone mad?

Let's say it's gone out of "equilibrium". The increase in the number of people on Earth, the increase in the number of connections and speed, leads to what scientists call a "non-linear", turbulent, or even chaotic state. And we're going to see that this can be good news!

Humanity is faced with increasingly extreme situations, particularly in the social, economic and, even more dramatically for the long term, ecological spheres. These are what we more commonly call "crises". Crises that are self-amplifying, creating a systemic crisis in which one leads to another, which in turn exacerbates the first, and so on in a vicious circle.

For example, each of these three problems - nuclear war (the almost forgotten threat that is reappearing on Europe's doorstep or in the Taiwan Strait...); ecological collapse (climate disruption, collapse of biodiversity, depletion of natural resources, new pandemics, etc.) and technological risks (the emergence of increasingly totalitarian states through control of our data, the uncontrolled explosion of Terminator-style artificial intelligence, the downgrading of the human being, etc.) is enough to threaten the future of human civilization. But taken together, they represent an unprecedented existential crisis, not least because they are likely to reinforce and combine with each other. In other words, these problems are not independent of each other, but rather interconnected. For example, a nuclear war could trigger a major ecological crisis, leading to considerable technological disruption. Similarly, technological disruption could cause ecological collapse, which in turn could lead to nuclear war.

Since the end of the Second World War, our parents and grandparents, whatever their country of origin, culture or religion, all shared one belief: they believed in progress. They were almost all convinced that their children - that's us!- would live in a world better than theirs. We're

the first generation of human beings in several generations to believe (ask around...) that we're going to leave future generations - our children - a planet in worse shape than ours, and that our own actions will not ensure their survival with any certainty.

Survivalism courses are packed. Billionaires are buying huge estates in New Zealand, supposedly the country the most remote from today's follies and risks. I wouldn't be surprised if the Cold War fallout shelters we used to talk about when I was young were back in vogue... Everybody take cover and save yourselves! We'll all end up with an axe deep in the forest, eating wild herbs and lighting ourselves with candles (if there are any left...).

In short: things are bad... but they can be better!

Indeed, according to chaos theories, two scenarios are possible: either everything collapses, or a new civilization emerges! Humanity has reached a fork in the road. We are in a period of complete redefinition of norms and values in terms of work, the economy and social life. Or put more simply: how do we want to live together?

As I said earlier, my mission is to convince those who are not yet convinced that we are living through a transition unprecedented in human history. So, I hope you can now help me in this mission by reminding you: it's the scale and speed of this transition that changes everything. My mission is also to find and share the tools to surf the tsunami of changes we are going through in order to leave a better world to our children. And that's what this book is all about.

VUCA or FANI?

More and more people are talking about the "VUCA" (*Volatility, Uncertainty, Complexity* and *Ambiguity*) world. Personally, I think that the VUCA world is already outdated, and that we should instead speak of the FANI world, which stands for Fragile, Anxiogenic, Non-linear and Incomprehensible...

Why use chaos theories?

Among the glasses and paradigms we use to see and understand the world, three have held an essential place over the centuries: spirituality or religions, philosophy and science. While religion was predominant for centuries, science has taken its revenge over the last two hundred

years. So much so, in fact, that it has often eliminated the others... So if science has taken such an important place in our way of seeing and understanding the world, the least we can do is check that our scientific "glasses" are up to date!

Well, our current scientific glasses are perfectly suited to a stable world, close to equilibrium or not too far from it. They're also perfectly suited to a binary world, true/false, good/evil, and so on. But the world is no longer stable. It has moved out of equilibrium, and in many areas has become turbulent and chaotic. It is therefore necessary to abandon a linear and binary vision, and instead develop a vision adapted to this new world. To do this, I'd like to start by showing you how our vision of the world is linked, among other things, to the scientific paradigm of each era. Let's take a look at the main scientific revolutions.

It's hard to pinpoint a starting date, so I suggest the invention of the wheel as the beginning of our technical and scientific adventure. This can be dated back some 5,000 years. As we can see with the wheel, great scientific revolutions sometimes take a long time to be understood and to spread, since it took almost 5,000 years to put one under our suitcases!

First revolution: how long does it take to fill your bathtub?

The first major scientific revolution was undoubtedly initiated by Newton, with his so-called "classical mechanics". With Newton, we discovered that nature is comprehensible. It is also predictable. One of the essential points of classical mechanics is that if we know the state of a system (positions and velocities of its various points) at the initial instant, we can calculate how this state varies over time, and thus determine the state of this system at any other instant. This is also why we speak of a deterministic vision: if you know the initial conditions, you'll know the system's evolution with certainty. The Cosmos is an immense machine whose every aspect, transformation and evolution we can understand and predict in absolute time and space.

The principles of classical, Newtonian mechanics are still the main paradigm, the main glasses, that we use to understand the world. And let's face it, there's nothing like classical mechanics to tell us how long it takes to fill a bathtub, or when two trains are going to pass each other. Most of us have mastered the essential principles. We humans

have long been under the impression that if we can simply understand the immutable laws of how things happen, we'll be perfectly capable of predicting, planning and managing the future. So we've made it our duty to find out how things happen, by discovering the laws and patterns that govern our world. Our tacit contract with the universe has been that if we work hard enough and think clearly enough, the universe will deliver its secrets, because the universe is knowable, and therefore at least somewhat flexible to our will. Classical mechanics is thus perfectly suited to analyzing, understanding and acting on phenomena at or close to equilibrium. It will help us, for example, to understand the different forces at play when we study a table placed on the floor (in equilibrium). It will also help us understand an oscillating system close to equilibrium, such as a pendulum.

In many everyday expressions, we can see how our thinking, our vision of the world, is influenced by classical mechanics: "I've found a good balance", "He's unbalanced", "It's always been like this, it's not going to change now", "It's all cyclical, it'll come back", "Watch out for the pendulum swinging back", "The wheel is turning", etc.

Second revolution: everything is relative!

Just over a hundred years ago, two revolutions in scientific thinking took place within a few years of each other: relativity and quantum mechanics.

The second major scientific revolution after Newton: Einstein's relativity. We learned some astonishing things. Nothing can go faster than the speed of light. The closer we get to the speed of light, the more time slows down. The sun bends the rays of light. Nothing can come out of a black hole. And so on... Above all, space and time are no longer absolute, as Newton stated. They are interrelated and can differ according to the observer. Einstein became more famous than a rock star. Even those who didn't understand his theories of special and general relativity understood that the world would never be the same again. The glasses have changed irrevocably, and the consequences of these changes will sometimes extend far beyond the realms of science. And here too, ordinary people are reappropriating what they have understood, or think they have understood, from the theories of relativity, and using it in language in the same way as when we say, "Everything is relative."

Third revolution: a quantum leap

Around the same time (what a time!), a third revolution in scientific thought took place, with Heisenberg, Planck, Bohr, de Broglie, Born, Schrödinger and others initiating what would come to be known as quantum mechanics. More and more astonishing things continued to emerge. For example, we learn that light can be a wave or a particle. Or that, contrary to classical deterministic mechanics, we can't know both the speed and position of something. Or that the probability of my going through a wall without damage to myself or the wall is not zero (don't try this at home, the probability isn't very high either...). This is the entry of probability into the previously deterministic world. It's impossible to predict exactly when and how certain phenomena will occur. It is only possible to know their probability.

Relativity was already a revolution in thinking, but at least it had the courtesy to preserve the rule of cause and effect. This is no longer the case with quantum mechanics, which calls it partly into question. Chance is beginning to make its grand entrance. Another wall of classical thinking collapses. And once again, this is reflected in expressions used in everyday language, for example: "It's a real quantum leap."

Fourth revolution: chaos theories

The latest and most recent major scientific revolution: the theories of chaos, turbulent systems and non-linear systems.

How old is chaos theory? It's hard to say. Indeed, while it's easy to date Mandelbrot's creation of the word "fractal", for example, many pieces of the puzzle had been observed long before by Poincaré, of course, but also Maxwell and even Einstein. So, when the new discoveries in chaos theory first appeared, few people knew how to make the connection. Mathematicians made a discovery in mathematics, while physicists made a discovery in physics, while meteorologists made a discovery in meteorology, and so on. In the same way, it's difficult to attribute the invention of chaos theories to a single person, as with classical mechanics (Newton) or relativity (Einstein), or to a limited number of people, as with quantum mechanics. With chaos theories, there is no longer any unity of person, place, time or even scientific field. People like Poincaré, Lorentz, Feigenbaum, Yorke, Ruelle,

Mandelbrot, Prigogine, etc. are involved in fields as different and sometimes as far apart as mathematics, physics, meteorology, finance, hydraulics, biology and so on. So we had to wait for the emergence of true integrators of thought, specialists in systemics and epistemology such as Ilya Prigogine and Isabelle Stengens, Edgar Morin and Erwin Lazslo, before we really saw the coherence of the whole and its applications to the evolution of our vision of the world. It could also be said that, while previous scientific revolutions have been fairly linear and binary (pre-Newton and post-Newton, pre-Einstein and post-Einstein), chaos theory has appeared more like a "fractal" puzzle that has been unfolding over the last forty years or so, and will surely continue to unfold in other fields. Chaos theory, which we'll finally and somewhat arbitrarily date to the late 1970s, is one of the first developments in science to affect as many different fields as finance, weather forecasting, or even more recent sciences such as neuroscience. Even today, chaos theory remains the least developed theoretically, empirically studied and practically applied. In this sense, it represents the most promising field for new ideas, techniques and applications. Chaos theory presents a new understanding of reality and our responsiveness to it. Its applications continue to extend to a wide range of human activities, far beyond its origins in mathematics and physics.

Why are chaos theories important to you?

Classical mechanics can be said to be on a human scale. It enables us to analyze systems and phenomena that are not too far from the human scale, neither too small nor too large. Classical, linear mechanics is thus perfectly suited to analyzing phenomena at our own scale, to understanding and acting in a world at, or close to, equilibrium. Also, because, among other reasons, we were relatively few on Earth and communicated relatively little compared to today, the glasses of classical, Newtonian mechanics were perfectly suited. We'll see that, while Newtonian mechanics remains ideal for understanding systems and phenomena in equilibrium or oscillating close to equilibrium, it is no longer at all suited to a world that has become chaotic and turbulent.

On the other hand, relativity and quantum mechanics don't really deal with phenomena on a human scale. In fact, it seems to me that most

of us are a long way from mastering all these concepts. Relativity deals mainly with the very, very large and the very, very fast. So, unless you travel at the speed of light, or live close to a black hole - which most of us don't - Einstein's new insights, essential though they are from a philosophical and spiritual point of view, won't necessarily change your understanding of everyday life. It should be noted, however, that the indirect consequences are nonetheless very real, with energy or nuclear weapons for example. We can simplify matters by saying that the theory of relativity doesn't really apply to the human scale, but rather to the infinitely large or the very fast.

Quantum mechanics, on the other hand, deals with the very, very small. And the insights it brings, essential though they may be from a philosophical and spiritual point of view, are not going to change your understanding of everyday life either. And, as with relativity, there are obviously very few of us who have mastered all its concepts. The consequences for our daily lives are still not dramatic although the indirect consequences are also starting to be important, with the transistor, the laser, etc. To simplify, we can say that quantum mechanical theories don't apply directly to the human scale, but rather to the infinitely small.

Unlike relativity and quantum mechanics, chaos theories deal with everything from the infinitely small to the infinitely large... and that includes the human dimension. So they can help us gain new insights into our chaotic world.

Collapse or emergence?

In one of his short stories, visionary science-fiction writer Isaac Asimov tells us the story of a people who, generation after generation, civilization after civilization, ask a giant computer: "Will we ever be able to beat the second principle of thermodynamics?" And for generations and generations, centuries and centuries, the computer systematically answers the same thing: "The data are not sufficient to answer this question." Billions of years pass, stars and galaxies die, but the computer, directly connected to the energy of space-time, continues to calculate. In the end, the universe is dead, but the computer finally arrives at its answer. It now knows how to beat the second principle... and that's when a new universe is born.

Entropy (loosely translated as the measure of disorder) reigns, and nothing escapes the implacable grip of the second law of thermodynamics. That's what we learned at school: with every passing moment, our world, our solar system, indeed our entire galaxy, moves ever closer to its inevitable demise at the end of time. Warm water doesn't naturally separate into hot water on one side and cold water on the other. A broken egg will not reconstitute itself. The disorder can only increase. All previous civilizations have collapsed (the Mayas, Easter Island, the Roman Empire, etc.). Everything will return to dust.

Civilizations, in particular, are very fragile constructions. They rest on a set of beliefs shared by their people. Their belief in the rightness of their values, their belief in the strength of their system of law and order, and perhaps above all, their belief in their future - what we'll call in the rest of this book a "dream" or "strange attractor". All it takes for this belief to evaporate is for the edifice to rapidly collapse, as history is littered with examples.

But chaos theories teach us that this inevitable return to disorder, the predicted collapse, is only part of the story! They do not call into question the second principle of thermodynamics. They do not deny that everything will return to dust, but they also show us an incredible emergence of complexity since the beginning of the universe. Evolutionary biologists generally tend to deny any kind of direction or intention to evolution, seeing it all as a random series of events and blind natural selection. But this point of view is merely a vestige of the reductionist scientific materialism of the XIX^{e} century. It overlooks more current scientific concepts, starting with Ilya Prigogine's Nobel Prize-winning discoveries that even non-living material systems have an inherent tendency towards self-organization. As we'll see later, when physical systems are pushed "far from equilibrium", they escape disorder by leaping into a higher state of organized order. If non-living matter intrinsically possesses this self-organizing drive, living systems certainly do. From the dawn of time, where there seemed to be nothing but a vacuum, matter appeared, then life, then consciousness. The universe has never stopped growing in complexity! It has never stopped evolving. Man and humanity have done the same. So, while many civilizations have collapsed, the "human civilization", the *Homo Sapiens* civilization, is still thriving (at least if you're reading this book) and, as we shall see, has only grown in complexity.

From atoms to molecules, from single-cell organisms to multi-cell organisms, from the reptilian brain to the mammalian brain to the human neocortex, the universe has never ceased to demonstrate inexhaustible creativity. It has never ceased to integrate what exists, to grow in complexity and evolve, through the mineral and the living, towards greater consciousness, towards more beauty, truth and goodness. Evolution, self-organization, integration and emergence are "the other part of the story". And we are living in a unique moment when humanity, itself the product of billions of years of evolution, suddenly becomes aware of this evolutionary process. Chaos theories provide us with essential elements for understanding how we can encourage this evolution towards greater complexity (volunteers for the return to death and dust?) They show us how a system can evolve either towards greater entropy or towards greater complexity. They also allow us, with a radically new way of seeing the world, to participate in this evolution.

This is the first time in human history that man has realized that he is both spectator and actor in the evolution of the universe!

Let's take a look at the three states a system can have, using a classic example used in chaos theory to understand the evolution of turbulent or chaotic systems: water flowing from the tap. Try it out at home (it's even easier to observe with a river... but it's more complicated to do in an apartment!).

THE BALANCE

If you open a faucet very gently, you'll probably be able to get a steady, seemingly immobile flow of water. This is known as the "stationary", "linear" or "laminar" state. If, with great care, you continue to slowly open the tap, you may be able to observe a slight, regular pulsation of the water column. This is the "oscillating" or "periodic" state. If you continue to open the tap, the pulsation will become irregular, and if you open the tap even wider, the flow will become turbulent. Increase the flow. At a certain point, the trickle will turn into a totally chaotic torrent. This is the turbulent or chaotic state. It's chaos! But don't stop there! If you increase the flow even further, a surprising phenomenon can occur. Vortices may appear. Order emerges from chaos. Order emerges from disorder!

We can illustrate these phenomena in simplified terms with the diagrams below.

A system can be stable, in equilibrium (symbolized here by a straight line): it doesn't move, it doesn't evolve.

Balance - equilibrium

Then, at a certain point, the system may start to oscillate, like the tap water described above, or like a pendulum. This is the part symbolized by a sinusoid in the diagrams below. In this part, the system is still under some form of control. There are negative feedback effects. It's like a thermostat. If the heat rises above a certain temperature, the heating is turned off. Similarly, if the temperature drops too low, the heating is turned back on.

Oscillation close to equilibrium

The physical sciences, and our way of seeing the world in general, tend to focus on systems in equilibrium or close to equilibrium. These systems behave in a predictable, linear fashion, which enables the sciences to deal with them. They always return to their predictable initial state. For example, if you touch the pendulum of a clock, it will resume its initial oscillation after a certain amount of time. Once we understand how a system in equilibrium or oscillating close to equilibrium works, we can predict and control it.

But let's see what happens when we move away from equilibrium...

THE TIPPING POINT

At the start of what we'll call "the Covid crisis" in 2020, the questions I was asked most were:

- **Will it return to the way it was?**
- **Will it be better afterwards?**

Let's see how chaos theories can help us answer this kind of question.

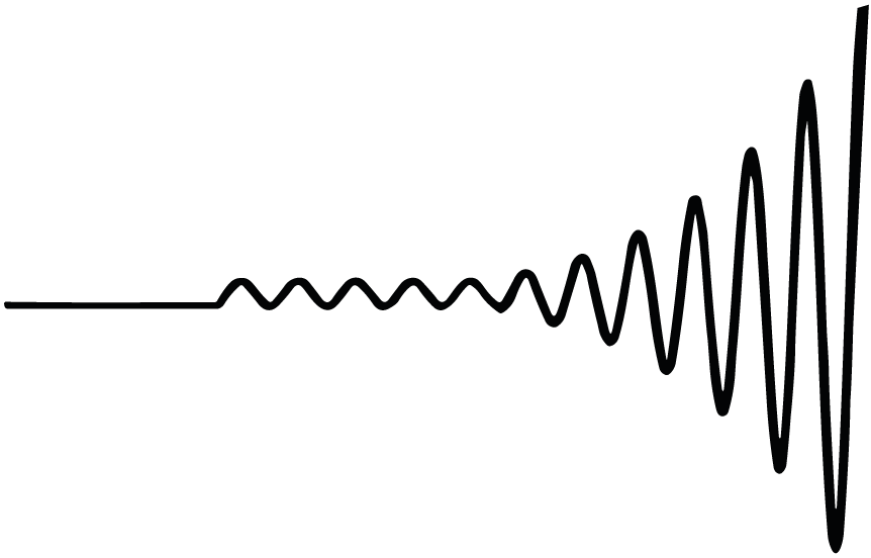
Above a certain threshold, known as the "*tipping point*", the system can move out of equilibrium. Oscillations then become increasingly amplified. And chaos theories teach us that once beyond this point, the system can never return to its previous equilibrium. There are what we call "positive feedback effects". The phenomenon is self-amplifying. The higher the temperature, the more you turn up the heat. There are many examples of positive feedback in physical, biological and social systems. For example, positive feedback is at the origin of our birth: the pressure of the baby's head stimulates uterine contractions. The contractions push the head further, further increasing the contractions. The positive feedback thus contributes to the expulsion of the baby from the uterus. And here we are, a few years later, writing or reading books about the future of the world!

The tipping point in the ethnic breakdown of neighborhoods

Malcolm Gladwell has written the bestseller *The Tipping Point*. In it, he describes, with an accumulation of historical examples and detailed explanations, how a great many social processes (fashions, changes in attitudes, crime rates, revolutions, epidemics) emerge in the form of a snowball effect. The notion of the tipping point, he writes, is based on this possible suddenness of change, undoubtedly the most difficult idea to accept. The term 'tipping point' was first used in the 1970s to describe the white suburban rush in the northeastern United States. When the number of African-Americans in a neighborhood reached a certain point - say, 20% - most whites left immediately. The community, sociologists observed, tipped over. The tipping point is a threshold, a boiling point, the moment when a critical mass is reached."

This can also be seen on the positive side: in effect, it means that the switch to much greener policies and practices does not require the entire population to be convinced of its necessity, but only 10 to 15%, a proportion that corresponds to a *tipping point* towards the generalization of a new paradigm...

Let's also look at the creation of a social network such as Facebook, Instagram or TikTok. If few people use it, few people will want to join. On the other hand, the more your friends use it, the more tempted you are to join. The more people use it, the more people want to use it, and the more people use it, and so on... Positive feedback is therefore an accentuation, an amplification, an acceleration of a process by itself upon itself: population growth, thermonuclear reaction, compound interests, economic depression, crowd panic, and so on. In everyday language, we sometimes also speak of a vicious or virtuous circle, depending on whether we like the acceleration of effects or not...



Tipping point and auto-amplification

The "Oh shit" of climate

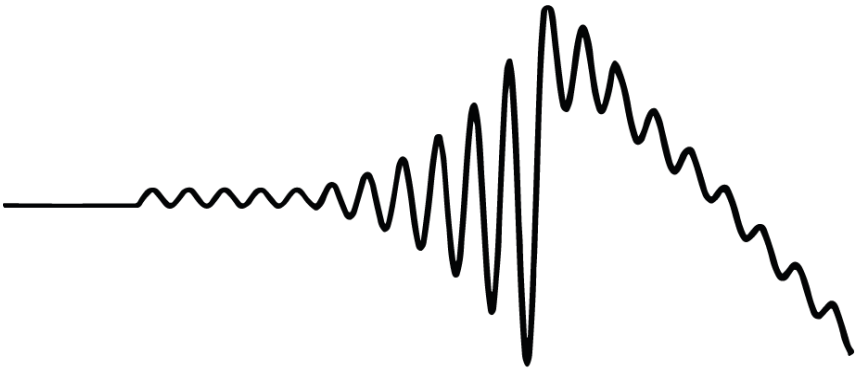
Hans Joachim Schellnhuber, founder of the Potsdam Institute for Climate Impact Research, was one of the first scientists to analyze the phenomenon of climate tipping points. Some fifteen years ago, the pieces of the puzzle fell into place in his mind: "It was like saying to myself: Oh shit! I realized that the planetary machinery - the monsoons, the ocean circulation, the jet stream, the large ecosystems - is full of non-linear systems. That's why there are so many points of no return. It's like uncorking a bottle, and we're uncorking them one after the other."

Antarctic ice shelves, for example, the extension of glaciers onto the ocean, are being weakened by global warming. If they give way, huge glaciers could be precipitated into the water, raising sea levels by several meters. In the Arctic, permafrost - permanently frozen ground - is thawing. This could eventually release into the atmosphere billions of tons of CO_2 , or even worse, methane, which is currently stored there. Another carbon sink threatened by global warming is the rainforest. The Brazilian Amazon recently became a net emitter of CO_2 .

Some want to believe that this concept of rupture can be translated in a more positive way in the fight against the climate crisis. This is what researchers call a "sociological tipping point", when a social and/or economic movement becomes irreversible and enough people have become aware of what's at stake and want to take positive action.

THE COLLAPSE

And finally, after equilibrium, oscillation and leaving equilibrium, what happens? Then, after the so-called "decision point", there are two possibilities: the first possibility is that the system collapses. The second principle of thermodynamics applies: everything will return to dust.



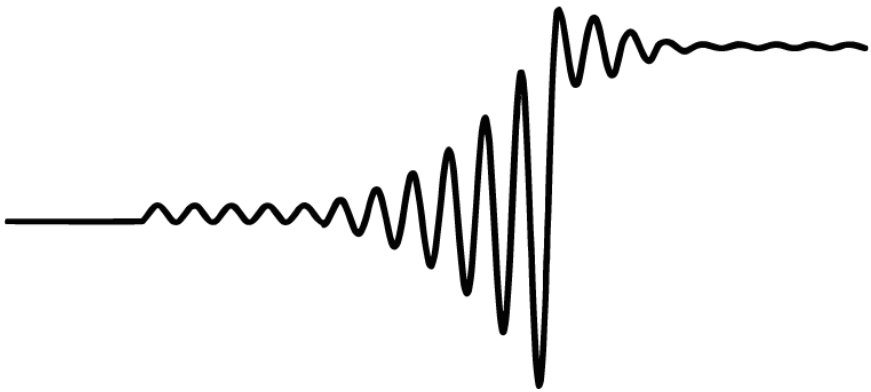
The collapse

The collapse of Rome

The first city in the world to reach a population of one million seems to be the city of Rome. This gives an idea of the complexity the Romans had achieved by then. They were able to feed, transport and organize the lives of a million inhabitants. When Rome collapsed in around 450 AD, the population, according to some estimates, fell from one million to 30,000 in less than thirty years. When it collapses, it does collapse! Note that, at the time, this collapse hardly affected the Indians or the Chinese. This collapse, despite the size of the Roman Empire, remained fairly localized. And another important point is that, if Rome wasn't built in a day, it wasn't defeated in a day either - it took thirty years. Given the number of human beings on Earth today, and their connections, we can imagine that a similar collapse today would not be so localized, but would affect the whole of humanity... and would not take thirty years!

THE EMERGENCE

But there's another possibility, according to chaos theories. Emergence may occur, and the system may find a new equilibrium at a higher level of complexity. Examples are the evolution of living organisms, which we'll describe in the next paragraph, and of the universe in general: from atoms to molecules, from single-cell organisms to multi-cell organisms, from the reptilian brain to the mammalian brain, right up to the human neocortex: the system integrates what already exists and self-organizes to grow in complexity:



The emergence

Personal collapse

This pattern of collapse or emergence can easily be applied to our personal lives. I remember with great emotion a participant in one of my seminars who, when I was presenting this evolution of emergence or collapse, said to the other participants: "I've been through something similar and I'd like to share it with you". He then told us how he had accompanied his very young son, who was suffering from an incurable disease, until the latter's death. He told us how his life seemed to be in balance, only to be turned upside down by the discovery of his son's illness, and how he, his wife and the rest of the family went through hopes and disappointments, ups and downs of ever-increasing extremes. And finally, he told us how this experience almost drove him into depression and collapse, but how, in the end, he feels today how this experience has helped him

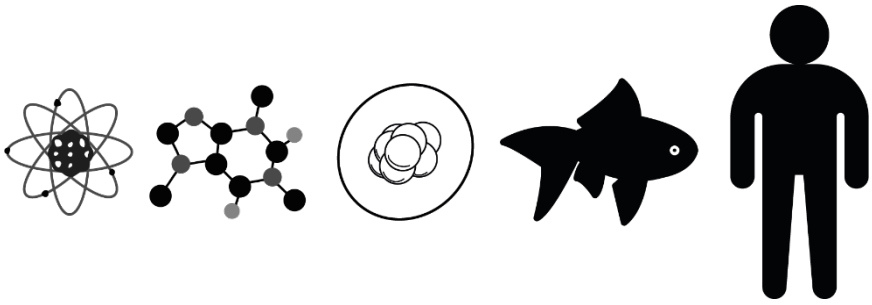
evolve in life and how today, along with the sadness that is always present, he also feels a great deal of gratitude for everything that has happened to him and enabled him to evolve.

Touched at the same time by the horror of his story and the relevance of his example to my subject, I've rarely found it so difficult to get on with the rest of my seminar...

Since then, many other people have told me that they have had a similar experience. For example, Donald Meichenbaum, a trauma researcher with fifty years' experience, has stated that of all people who experience trauma, he estimates that 30% suffer from post-traumatic shock, and that 70% experience some form of growth, of personal evolution following the traumatic event.

What is emergence?

The increase in complexity with each emergence is an important point, so what is complexity? And what is emergence?



Emergences in the living world

Emergence comes from the study of complex adaptive systems (ant colonies, neural networks, the immune system, the Internet, the global economy). It describes systems whose complex behavior is more than the sum of its simple parts. Think of board games like chess - a few dozen rules governing just 64 squares somehow produce possibilities we're still discovering after two centuries of study. Or think of a seed: it contains specifications for unlimited variations of structures thousands of times its size.

Tropical winds become hurricanes. Seeds and embryos become fully-developed living creatures. Self-amplifying effects seem to be the *sine qua non of* change, surprise, life itself, emergence. Many of the world's most important and least understood phenomena exhibit emergent properties, from consciousness and intelligence to ethics and life itself. Life is an emergence, the result of the interaction of DNA, proteins and a myriad of other types of molecules. The mind is another emergence, the product of billions of neurons. A civilization is an emergence, the result of the interactions and "living together" of millions or billions of human beings.

Even if you're not a physicist, you can imagine that a molecule is a collection of atoms... with additional properties to the simple addition of atoms. For example, water molecules (H_2O) have properties totally different from those of their constituent elements; they are a co-creation emerging from two hydrogen atoms and one oxygen atom. Water does not have the same properties as two hydrogen atoms and one oxygen atom. It's also often said that the whole is greater than the sum of its parts. There's "a little something extra".

Similarly, a living cell made up of several molecules possesses "emergent" properties that a simple addition of molecules does not. Once again, there's "a little something extra". Something that didn't exist before suddenly appears.

This little extra, this generation of novelties, is what we call "emergence".

You who are reading this book are not just a bunch of atoms sitting on a chair, you have "a little something extra". That something extra is complexity. You are the result of the many emergences that have punctuated the history of life.

The free order

Theoretical biologist Stuart Kauffman says that emergence is like "order for free", an unexpected leap into higher forms of complexity and order from chaos.

Can we create our own emergence? And if so, how do we create positive emergence in a system as dynamic and complex as our lives or humanity? On the one hand, I believe it's wise to fully accept uncertainty, ignorance and unpredictability with profound humility. And on the other hand, I also believe that we can choose to act with

the conviction that we can create emergence in complex systems. As Gall's Law of Complex Systems puts it, and as we'll see throughout this book: "A complex system that works invariably turns out to have evolved from a simple system that worked. A complex system designed from scratch never works."

When molecules first emerged, I don't think any atom wrote a book about the possibility of collapse or emergence. *Ditto* for other emergences such as cells, living organisms, etc. Until recently, the chaos or complexity sciences studied systems with a rather low level of consciousness, such as bacteria, ants, termites or a computer simulation (called *automata*).

Termites and skyscraper construction

Termites aren't very complex creatures, just a few millimeters long, with no eyes, no wings and a transparent abdomen. Put them in groups, however, and they can pile up pinhead-sized balls of earth, one after the other, until a complex mound takes shape. By the time this mound reaches a height of 5 meters, it will have a scale equivalent to that of the Burj Khalifa, the world's tallest Dubai tower. Underneath the termite mound lies a symbiotic fungus, which digests grass and requires constant care from the "workers". Although termites build without the help of architects or engineers, their mounds are ingeniously constructed, using signals known only to insects.

A French termite researcher named Pierre-Paul Grassé coined the term "Stigmergy" in 1959 to describe how the work of each termite guides that of the next. A termite picks up a ball of earth, puts its saliva on it, then drops the ball of earth. The smell of the saliva - perhaps containing a chemical signal called "cement pheromone" - provides a signal to the next termite to drop its own ball of earth. As more and more termites drop more balls onto the pile, the olfactory signal becomes stronger and stronger, and this positive feedback cycle encourages more termites to drop their dirt balls. Small towers of balls form and some become pillars, and some pillars become walls, coordinated solely by the interactions of separate termites and their environment, not by a master plan. The pheromone scent fades over time, and small arrows that don't attract many termites don't get new pheromones and don't grow into walls and pillars, as Lise Margonelli explains in *Underbug* (Scientific American, 2018).

Emergence or collapse has been studied with agents of a rather low level of consciousness (without wishing to belittle our friends the

termites, of course). I'm prepared to support the hypothesis that your level of consciousness and your ability to make choices are far superior to those of a bacterium or a termite.

And that changes everything!

Unlike bacteria or termites, we can imagine and dream our future. Human beings have the capacity for intention. Unlike termites. We can have a dream. The termite and most living beings have, *a priori,* no intention, no dream. They produce incredible achievements by simply repeating very simple tasks, the result of selective and/or cooperative evolution, without intention and without dream (Leeloo, the dog sitting next to me as I am writing this points out that she doesn't agree at all...).

Human beings have the capacity for intention, what we'll call in the second chapter of this book a "strange attractor". We human beings can also conceive and decide to change the way we act on a daily basis. We can test, decide and invent new ways of living together to create new ruptures, new emergences. Human beings can repeat the right operations to create emergences in line with their dream, their intention, as we'll see in the third chapter of this book.

This is the first time in human life, indeed in the history of life itself, that we can have this conversation about the collapse of our civilization or the emergence of a new civilization. This makes a big difference, because we can decide to design our future by creating a context more conducive to the emergence of this new civilization. Right now, we're still like unorganized termites. Perhaps more intelligent, but much more individualistic and therefore without common dreams.

As we've just seen in this introduction, as a result of increasing numbers, connectivity and speed, we're living in a more complex, more uncertain, more chaotic world. Chaos and complexity theories teach us that a system can only survive in its environment if its level of internal complexity is at least equal to the level of complexity of its environment. The aim of the rest of this book is to show you how to encourage emergence, the higher level of complexity, the "little extra" in our lives, our organizations and for humanity.

Antifragile
In 2011, Nassim Taleb wrote about a concept he dubbed "antifragility". Taleb explains that while some systems weaken

under the stress of external forces, other systems gain strength under the stress of external forces. He thus distinguishes between fragile systems, robust systems and antifragile systems.

Glass is fragile: it shatters easily. The banking system is fragile, because unexpected changes in politics or the economy can cause it to collapse. Fragile systems need to be protected if they are to retain their properties. Robust systems, on the other hand, are highly resistant to change. Whereas a vase is fragile and breaks easily, a soccer ball is robust. You can throw it against a wall for weeks and nothing will happen to it. Often, we aim to make fragile systems more robust. You hire a good lawyer to make your business more robust. The government passes regulations to make the financial system more robust. We institute rules and laws like traffic rules on the road and property rights to make our society more robust.

There's a third type of system: the "antifragile" system. Whereas a fragile system collapses and a robust system resists change, the antifragile system takes advantage of external stressors and pressures. The result is the emergence of new qualities. Start-ups are antifragile companies: they look for ways to fail quickly and learn from those failures. War veterans and journalists often talk about how the chaos of combat strengthens them and their relationships with others. A collection of human beings (or other living beings) is antifragile. If a new virus eliminates the weakest, then the humans who remain after the epidemic are a stronger, more resistant group than before the epidemic.

The human mind can be fragile or antifragile, depending on how you use it. When struck by disorder, our brain tries to make sense of it. It seeks to "learn". This allows us to take advantage of the initial disorder. For example, once you've found a solution to a problem, you can use that solution again when you encounter a similar problem.

Chaos is neither good nor bad

Interestingly, the words "chaos" has a negative connotation for most people. "He's chaos" is rarely compliments.

In fact, the dictionary defines chaos as follows:

- a collection of things turned upside down, giving the image of destruction, ruin and disorder;

- a state of general confusion;
- a general confusion of the elements of matter, before the formation of the world.

Thus, many connotations of the concept of chaos have a negative connotation. Chaos is often associated with turbulence, disorder, disarray or anarchy. All these synonyms give rise to stress and fears of loss of control, danger and the unknown. It's time to abandon these negative reactions and start seeing chaos as a natural phenomenon. As such, chaos is an aspect of the way things evolve in our universe, and is neither good nor bad, it is simply present. Chaos is like day and night, winter and summer. It's part of the natural processes that govern our world. For science, chaos is simply the description of a state of things. Neither good nor evil. Just as water can be a gas (vapor), a liquid or a solid (ice), a set of elements, a system can be in a state of equilibrium, linear, oscillating, or turbulent and chaotic. The turbulent or chaotic state can therefore be seen as a particular phase of a system. Like matter, which can be in a gaseous, liquid or solid phase, a system can be in a linear, oscillating or chaotic phase.

And as we'll see throughout this book, chaos, thanks to the emergence phenomena it brings about, is the source of novelty and innovation in our lives and organizations, and for humanity as a whole.

So, is it going to go back to the way it was?

No, things aren't going to go back to the way they were, at least in a number of areas. We've already passed a certain number of thresholds, of *tipping points*, and according to chaos theories, once you've passed the *tipping point,* things can't go back to the previous equilibrium. For example, in the case of the Covid crisis, look at remote working. If we project the pre-Covid curves, it would have taken twenty years or more to get to the number of people working from home today.

We used to talk about cyclical crises: the "bubble" phenomenon. It goes up, up, up, then the bubble bursts. And so it begins again... Of course, there are always cyclical crises. Today, these are superimposed on crises known as "systemic crises" or "polycrisis". A health crisis can lead to an economic crisis, which in turn can lead to a social crisis,

which in turn can lead to a political crisis, and so on. If we take the example of remote work, its widespread use can lead to a reduction in the need for office space, and thus to a crisis in commercial real estate, which in turn can aggravate an economic crisis, which in turn can lead to another political and social crisis, and so on.

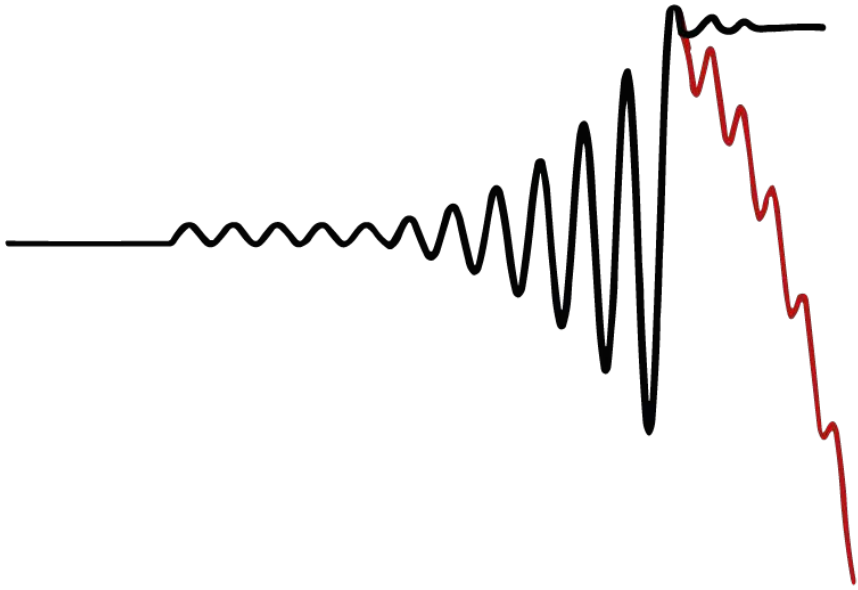
The difficulty of thinking exponential

Ray Kurzweil, CTO at Google, explains why it's so hard for us to envision the future we're heading towards. He argues that all our ancestral heuristics are linear: tracking an antelope running across a savannah or estimating how long a food supply will last. He explains that, due to Moore's Law (the number of transistors in processors is expected to double every two years, forever), we are entering a phase of exponential change, and these heuristics are no longer appropriate.

And will it get better afterwards? That depends.

I've got some bad news and some good news... The bad news: as we've just seen, after the so-called "chaotic" phase (where self-amplification occurs), there can be a *collapse*. The system collapses. It's the second law of thermodynamics: *everything will return to dust,* you can't "unscramble" a scrambled egg... Organizations, companies, even civilization will collapse sooner or later. Yet, despite all this, we see plenty of order and structure around us! Fallen logs rot, but trees grow too. And civilizations progress in complexity. So, what's the good news? After the "chaotic" phase, as we've also just seen, a new equilibrium can emerge, a new system, always more complex than the previous one. This is sometimes referred to as a phase change. Edgar Morin speaks of metamorphosis. After the chaotic phase, we can see the emergence of new businesses, new social organizations, new ways of living together, and perhaps even the emergence of a new civilization!

Please note that emergence does not mean the disappearance of the entire previous system. On the contrary, when there is emergence, the new system transcends and includes elements of the previous system: like your body, which includes organs that themselves include cells, which themselves include molecules that include atoms, and so on.



Emergence or collapse?

So yes, it can be better than before if you're on the side of emergence. There are the "collapsologists" who believe that we are all doomed (and they're not necessarily wrong, as we've seen, the system can collapse), and you can choose to become an "emergeologist", one who not only believes in, but above all works towards emergences! In the rest of this book, we'll look at how you can use chaos theories to your advantage and develop new tools for action in our more uncertain and chaotic world. And in the second and third chapters, you'll discover all the practical exercises you need to get through crises, encourage emergence, thrive in this more uncertain world, be more resilient and even profit from crises.

Because the world has become more chaotic, we can more than ever encourage emergence in our personal lives, our organizations, find "that little something extra", and above all understand and act to avoid collapse and not all end up with an axe deep in of the forest!