CHAPTER 9

The Dead versus the Living Universe

The following is broadly the causal reasoning we have presented in this book: The mechanistic ideology has put more and more individuals into a state of social isolation, unsettled by a lack of meaning, free-floating anxiety and uneasiness, as well as latent frustration and aggression. These conditions led to large-scale and long-lasting mass formation, and this mass formation in turn led to the emergence of totalitarian state systems.

Therefore, mass formation and totalitarianism are in fact *symptoms* of the mechanistic ideology. Just like an individual physical or psychological symptom, these social symptoms signal an underlying problem: In this case, that a large proportion of the population feels socially isolated and suffers from intense experiences of anxiety and meaninglessness. And just like individual symptoms, they generate a *disease gain*. For example, they transform the experiences of social isolation and fear into an illusion of connectedness. And as with individual symptoms, they generate this disease gain while failing to solve the underlying problem itself.

For this reason, we need an analysis of the underlying problem—that is, the cause of the symptom, namely the mechanistic ideology. Societies are primarily besieged by *ideas*. The most fundamental change that we as a society have to aim for is not a change in practical terms but a change in consciousness. In the first part of this book, we examined the psychological problems caused by the mechanistic ideology; in the final part, we will examine how we can transcend this ideology. In this chapter, we will reflect upon one of the core characteristics of the mechanistic ideology. This ideology sees the universe as a logically knowable, predictable, controllable, and undirected mechanical process. And above all, it sees the universe as a dead and meaningless given, as the blind, mechanistic interaction between dead, elementary particles. While such a view of the world and matter imposes itself as the only scientifically valid view, a thorough examination teaches us that, from a scientific point of view, this world view is actually outdated.

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The mechanistic worldview is, in fact, as old as man himself, or at least, it was already present in what we usually consider the early days of Western civilization. In the era of the ancient Greeks, about 400 BCE, atomists such as Leucippus and Democritus were already defending the idea that the universe, in its entirety, was essentially a collection of mechanically interacting material particles. Those particles were already called *atoms*, which means "indivisible" or, more literally, "unsliceable" (*atomos*).

It was not until the Enlightenment, however, that mechanistic thinking became dominant and provided the only remaining Grand Narrative of Western culture. As we discussed in chapter 1, this ideology even furnished a kind of creation myth: Everything starts with a big bang that sets the machine of the universe in motion and, through a series of mechanistic effects, produces first a series of inorganic elements and subsequently also living beings. Within this reasoning, the world is a dead mechanistic process, an enormous chain reaction of collisions of elementary particles that continues endlessly, without purpose or direction, and somewhere along the way, randomly produces life and mankind.

This entire process is seen as strictly predictable. The French mathematician Pierre-Simon Laplace expressed this in perhaps the most direct way:

> *We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it […] it would embrace in the*

> *same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing could be uncertain and the future, as the past, would be present to its eyes.*[1]

Most philosophers have considered such a worldview to be naive. Bertrand Russell, for example, argued in his Russell's paradox that there can never be an entity, however much computing power it has, that can have complete knowledge.[2] Such an entity would also have to have a complete knowledge of itself, and also a complete knowledge of itself as an entity possessing complete knowledge of itself, and so on to infinity. In the twentieth century, Werner Heisenberg also proved this concretely: One cannot speak of elementary particles in terms of certainty. The more accurately their position in time is determined, the more uncertain becomes their location in space. "Not only is the universe stranger than we think; it is stranger than we can think." (See Heisenberg's uncertainty principle.)[3]

These elementary building blocks of the universe—atoms—appeared to be both more complex and more elusive than previously thought. The more the researcher's hand tried to close itself around them, the more they slipped through his fingers. Rather than the tiny, massive spheres envisioned by the ancient Greeks, twentieth-century physics showed them to be swirling, energetic systems, patterns of vibration rather than solid matter. Yes, in the final analysis, they even turned out not to be material phenomena at all but rather to belong to the order of consciousness. The great physicists of the twentieth century believed them to be mere thought-forms, mental phenomena that respond to the consciousness of researchers (as we shall discuss further in the chapter 10).

We could of course delve deeper into the findings of quantum mechanics to further relativize the idea of a mechanistic universe. But the phenomena of which quantum mechanics speaks are situated in a dimension that most people will never have access to. Who will ever get a direct look at the subatomic world? In this respect, there is another field of science that offers better, more concrete perspectives, namely the complex and dynamic systems theory and the chaos theory. These theories deal with phenomena that everyone, in principle, can sensorily perceive and that illustrate the limitations of the mechanistic vision in an equally convincing way.

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When Benoit Mandelbrot—a brilliant mathematician, considered one of the founders of chaos theory—joined IBM, he was confronted with the problem of noise that interferes with computer signals transmitted over telephone lines.[4] This noise occurred due to a series of external factors, such as humidity, irregularities in the material of the lines, and small electromagnetic disturbances that hampered signal transmission in an accidental and incalculable way. We can only assume that these factors acted in a random way and independently from one another and therefore, normally, there cannot be any consistency in the noise on the telephone lines.

Mandelbrot was not a person who believed what everyone else believed, however. He was bold enough to assume that there might be a pattern in the noise after all. "Just because it doesn't make sense doesn't mean it can't exist," he said. And he was correct. In the noise, he discovered a well-known mathematical pattern, known as Cantor dust. Anyone can easily reproduce this pattern by repeatedly dividing a line into three segments and omitting the middle segment each time.

The big question, of course, is the following: How is it possible that a series of random factors, manifesting independently, can lead to a regular pattern? How could it be that damage caused to a cable by, say, a screwdriver and the magnetic disturbances of a thunderstorm become part of the same pattern? It is as if all these accidental, mechanical disturbances are drawn into a stable and strictly mathematically ordered field in order to be stripped of any coincidence. James Gleick put it this way: "Life sucks order from a sea of disorder."[5] The noise on a telephone line seems *to organize itself*. In living organisms, we have—erroneously—come to consider this quality of self-organization to be normal. Living beings breathe air, and eat and drink, and all these disparate elements bring about the ordered pattern of their bodies. However, when this phenomenon manifests itself in the inorganic world, we perceive it as a perplexing phenomenon and contrary to the prevailing worldview (which it is).

Another example is the regularity of water droplets, dripping from a faucet, as demonstrated by Robert Shaw.[6] This is an example from everyday life, observable by anyone. A relatively simple mathematical procedure suffices to show that there is mathematical regularity in the lapse of time between the drops dripping down, which, when represented visually, produces beautiful organic patterns. In this case as well, we encounter the curious paradox that the moment a drop of water drips down is, on the one hand, caused by a series of disconnected, external factors—the surface tension of the water, the temperature, vibrations in the surrounding air, the texture of the faucet's rim. But on the other hand, it seems to follow a strict pattern. The reason all these unrelated factors lead to a consistent pattern is difficult, even impossible, to explain within a mechanistic worldview. Obviously, this pattern can be disrupted by certain interferences—for example, by intentionally blocking the mouth of the faucet with your finger. However, after the cessation of this interference, where it is difficult to determine in which way it differs from the other external factors, the system returns to its spontaneous equilibrium and the pattern reinstates itself.

Gleick had the following to say about it: "Those studying chaotic dynamics discovered that the disorderly behavior of simple systems acted as a *creative* (italics added) process. It generated complexity: richly organized patterns, sometimes stable and sometimes unstable, sometimes finite and sometimes infinite, but always with the fascination of living things."[7] Please, take note of the qualifications *creative* and *living*. This aspect of creation and life in matter was overlooked by the classical scientific approach.

More or less in line with these examples, fractal theory (a subdomain of chaos theory) showed an unsuspected, mathematical determinacy of sets of natural forms, such as those of leaves, plants, trees, sea sponges, algae. The best-known examples are perhaps seashell patterns studied by Hans Meinhardt;[8] the Mandelbrot set; and the spiral shapes determined by the Fibonacci sequence. This last determination is so simple that it is easily understandable, even to nonmathematicians. The Fibonacci sequence consists of a series of numbers that is obtained by starting with the numbers 0 and 1 and then continuing with a number that is the sum of the two previous numbers (so 0, 1, 1, 2, 3, 5, 8, etc.). This series of numbers determines the curves of a spiral that can be found everywhere in nature. Galileo's famous statement in 1623 that "The book of nature is written in the language of mathematics" must be taken literally, it seems.[9]

Let's take a closer look at one example. Lorenz's chaotic waterwheel is a mechanical device that makes movements that show direct similarities with the dynamics of convection patterns in liquid and gas. (See figure 9.1.) It was designed by MIT professor Willem Malkus in 1972 to illustrate the work of Edward Lorenz, a mathematician and meteorologist and one of the founders of chaos theory. It consists of a rotating wheel to which small buckets with a bottom hole are attached. At the top, there is a tap that provides water flow into the top bucket. At a very low influx, the wheel does not move, simply because the water flows out of the hole in the bottom of the bucket faster than it flows in. At a slightly higher influx, the bucket will fill up and the wheel will start to move, sometimes in one direction, sometimes in the other. Once the wheel has chosen a certain direction, the behavior of the wheel is regular and predictable and directly correlated with the influx of water: The greater the influx, the faster it turns.

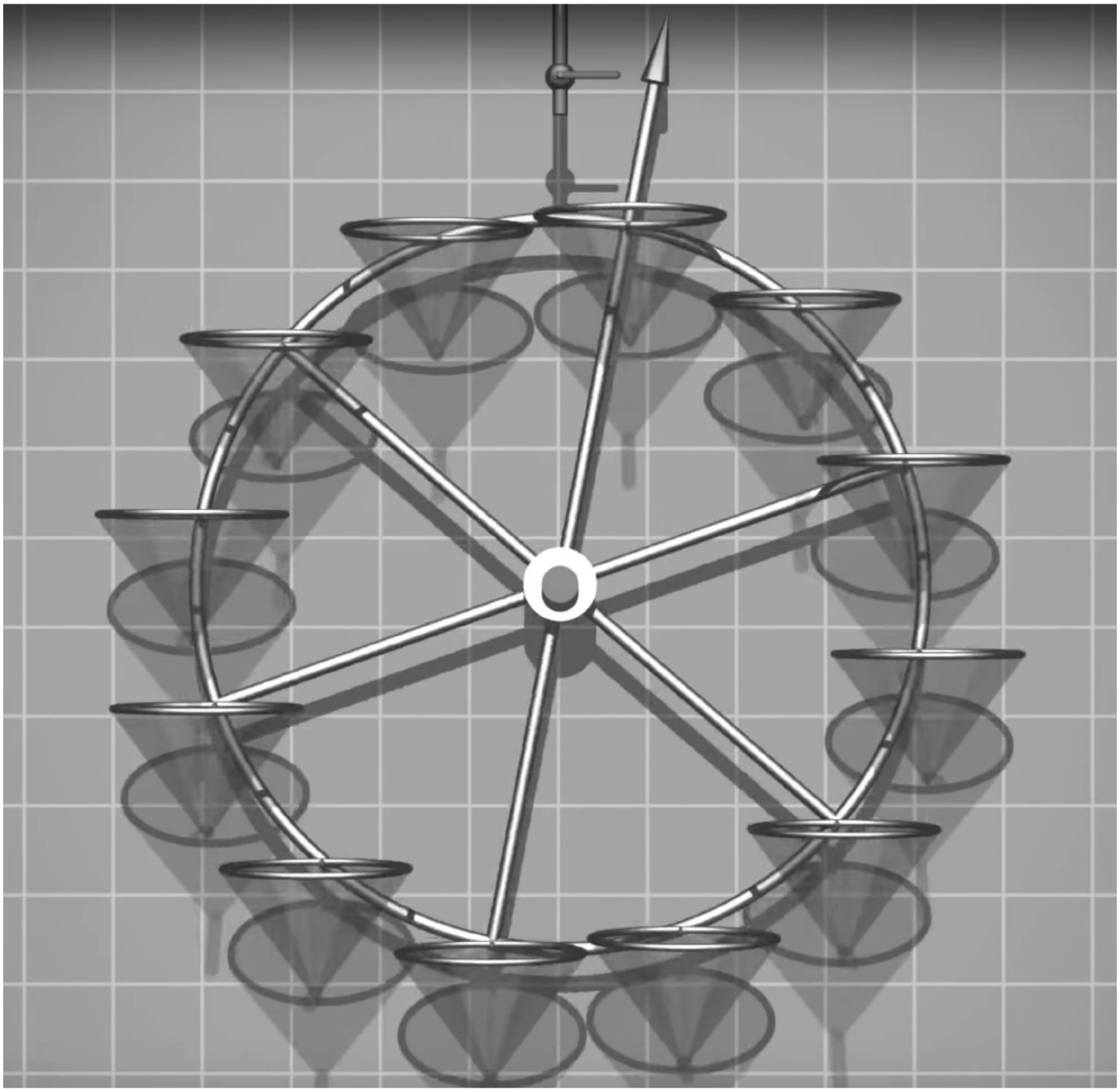

Figure 9.1. Lorenz's water wheel

If the influx exceeds a certain limit, however, a series of complex effects occur that cause the wheel to behave erratically. The top bucket initially fills to the brim, causing the wheel to turn at a high speed. But then, because of the high speed, the other buckets hardly get a chance to fill up as they pass by the top. This causes the wheel to slow down and possibly come to a temporary stop, whereupon it continues to rotate in the same direction, or sometimes in the opposite direction. This process is repeated with countless variations; the wheel sometimes moves quickly, sometimes slowly, sometimes in the same direction for a prolonged period of time, sometimes constantly changing direction. The irregularity in the chaotic phase was shown to be total in nature. This means that there is no (strictly) repeating pattern or repeating *period* in the wheel's movements.

No matter how chaotic the movements appear, they surprisingly turned out to be strictly determined. They can be described by a mathematical model consisting of three iterative differential equations with three unknowns (which in themselves are actually a simplification of the much more complex Navier-Stokes convection equations). In conformity with the chaotic behavior of the wheel, the (endless) series of solutions of these equations shows no periodicity either. Or, in other words, there is no recurring pattern in the set of values of the unknowns generated by the equations.

Therefore, the dynamics of the wheel closely resemble the structure of irrational numbers, such as pi, whose digits after the decimal point do not show any periodicity either. The qualification of such numbers as "irrational" primarily refers to the fact that such numbers cannot be written as a fraction, as a *ratio*. However, in laymen's terms, "irrational" in the sense of *not rational* is not incorrect either. It is true that such numbers cannot be rationally envisaged. That makes them disruptive in a logically ordered, rational worldview. Hippasus (a follower of Pythagoras)—who is considered the person who discovered these irrational numbers—experienced this to his own detriment. Legend has it, he was on a ship with his brethren Pythagoreans and was promptly thrown overboard when he articulated his intuition that there exists something such as irrational numbers. This illustrates clearly: The limits of the ratio always lead initially to *uncertainty, fear, and aggression*.

The combination of chaotic behavior and determinism gives the waterwheel the fascinating property of "deterministic unpredictability."[10] It amounts to the following: Even with the waterwheel formulas at hand, it is not possible to predict, even only one second in advance, how it will behave. The reason for this is simple: To be able to predict how the waterwheel will behave in the future, you need to measure the wheel's state of motion in the present and enter it into the formulas. But due to the nature of the wheel, even immeasurably small differences in the current state of motion can lead to radical differences in future behavior (in systems theory, this is called the property of “sensitivity to initial conditions”). Therefore, the wheel continues to shroud its future in mystery forever.

What is most fascinating about the story of Lorenz’s waterwheel is this: At some point, Lorenz got the idea to plot the successive values of the three quantities in the equations on a three-dimensional orthogonal coordinate system, also called *phase space* in chaos theory. Curiously enough, it was not just a random nebula of points that appeared, as one would initially expect with a chaotically behaving system. What emerged was a very regular figure with striking aesthetic features, which has since been known as the Lorenz attractor (see figure 9.2).

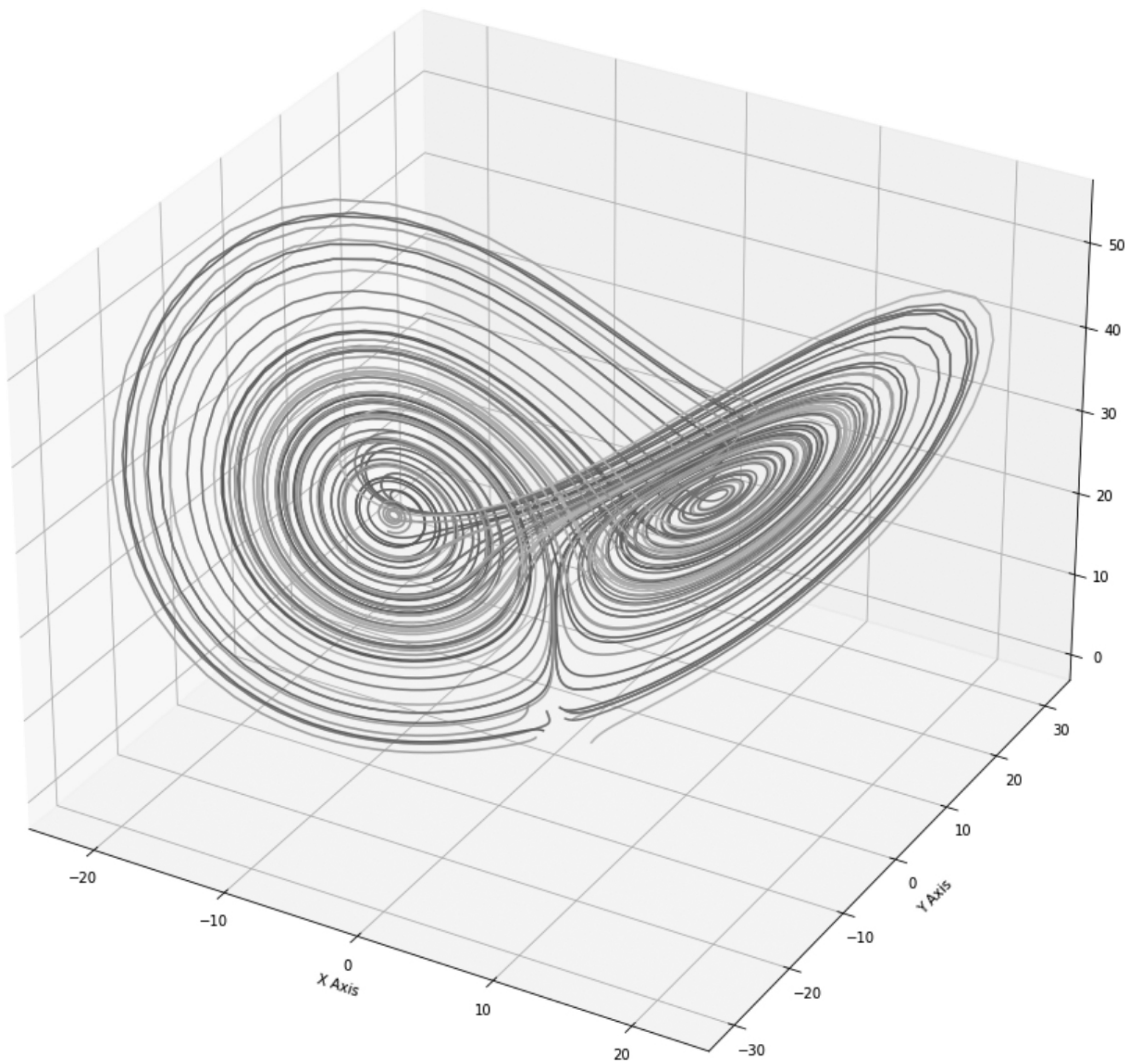

Figure 9.2. The Lorenz attractor

As Gleick said, “Phase-space portraits of physical systems exposed patterns of motion that were invisible otherwise, as an infrared landscape photograph can reveal patterns and details that exist just beyond the reach of perception.”[11] Lorenz was the first to show that certain chaotically manifesting behaviors are nevertheless determined by a strict (and sublime) order and can be visually represented in phase space. Hidden beneath the apparent chaos of the superficial experience of the wheel is an aesthetically magnificent order of universal forms, in many ways reminiscent of Plato’s ideal world. The quantum physicists also arrived at Plato’s famous ideal world, albeit via a different route. Heisenberg expressed this in perhaps the most direct way: “I think that modern physics has definitely decided in favor of Plato. The smallest units of matter are not objects in the ordinary sense; they are forms, ideas.…”[12]

This is without doubt the most important lesson that the waterwheel has to teach us: We cannot predict the specific behaviors of the waterwheel (at least not in its chaotic phase), but we can learn the principles by which it behaves and learn to sense the sublime aesthetic figures hidden beneath the chaotic surface of those behaviors. Hence, there is no rational predictability, but there is a certain degree of *intuitive* predictability. In 1914 already, Henri Poincaré argued that logical understanding is not always necessary to intuitively understand some phenomena and to make predictions based on one’s intuition.[13] It is possible to accurately sense the globality of the underlying structure of a phenomenon—for example the Lorenz attractor—without having any significant logical understanding of that phenomenon. Poincaré even went a step further, stating that pursuing logical knowledge about the phenomenon might, once a certain point is reached, be counterproductive. When confronted with the irrational aspect of a phenomenon, the persistence to obtain rational understanding will prevent us from coming to conclusions based on more direct receptiveness.

The way in which you experience the wheel as a spectator will strongly depend on the level at which your attention is focused. If you look at each isolated movement or motion sequence separately, the movements are perceived as chaotic and disparate. The wheel seems like a cacophony of abruptly interrupted back and forth movements. However, if you are able to feel affinity with the wheel and get to sense the deeper rhythms present in the variety of movements (as represented in the figure of the Lorenz attractor), then you experience the timeless, creative harmony that is present underneath the variety of superficial movements and the wheel becomes an appeasing phenomenon.

In this respect, the wheel teaches us something that applies to a far broader extent to the human being, society, life, and nature. Just like the wheel, most phenomena in nature are complex and dynamic and, in their complexity, are rather unpredictable. But like the wheel, life follows certain principles and sublime phenomena are hidden beneath its seemingly chaotic surface. And this is perhaps a person's greatest task: to discover the timeless principles of life, in and through all the complexity of existence. The better we can sense those principles, the more we feel that we start to understand some of the essence of life and that we are connected with the majestic, ordering principle that speaks to us from across the universe. And the more we stick to our principles, even if it seems to our own detriment in the short term, the more real these principles become and the more we develop, as human beings, a real sense of existence and fortitude. Being too opportunistic and relinquishing our principles because "smart" analysis of a situation suggests it might be advantageous, often leads to a loss of individuality and experiences of meaninglessness. If one focuses too much on the superficial appearances of life and loses touch with the underlying principles and figures, life will increasingly be experienced as a meaningless chaos, just like Lorenz's waterwheel.

The same applies at the societal level: A society primarily has to stay connected with a number of principles and fundamental rights, such as the right to freedom of speech, the right to self-determination, and the right to freedom of religion or belief. If a society fails to respect these fundamental rights of the individual, if it allows fear to escalate to such an extent that every form of individuality, intimacy, privacy, and personal initiative is regarded as an intolerable threat to "the collective well-being," it will decay into chaos and absurdity. The belief in the mechanistic nature of the universe and the associated overestimation of the powers of human intellect, typical of the Enlightenment, were accompanied by a tendency to lead society in a less and less principled manner. Within a purely mechanistic way of thinking, it is extremely difficult (not to say impossible) to ground ethical principles. Why should a machine man in a machine universe have to adhere to principles and ethical rules in relationships with others? Isn't it ultimately about being the *fittest* in the struggle for survival? And therefore, aren't ethics and principles a hindrance rather than a merit? In the final analysis, it was no longer a question for Enlightenment people to adhere to commandments and prohibitions or ethical and moral principles, but to move through this struggle for survival in the most efficient way possible based on "objective knowledge" of the world. This culminated in totalitarian and technocratic forms of government, where decisions are not made on the basis of generally applicable laws and principles but on the basis of the analysis of "experts." For this reason, totalitarianism always chooses to abolish laws, or fails to implement them, and prefers to rule "by decree." This means that, each new situation will require the formulation of new rules on the basis of a (pseudo)rational assessment of such situation. History abundantly illustrates that this leads to erratic, absurd, and ever-changing rules, which ultimately destroy all humanity in society.

This is perhaps the most direct and concrete illustration of Hannah Arendt's thesis that ultimately totalitarianism is the symptom of a naive belief in the omnipotence of human rationality. Therefore, the antidote to totalitarianism lies in an attitude to life that is not blinded by a rational understanding of superficial manifestations of life and that seeks to be connected with the principles and figures that are hidden beneath those manifestations.

Chaos theory and the complex and dynamic systems theory open a breathtaking new perspective on the universe. In his widely acclaimed book *Chaos*, Gleick states that chaos theory is the third great scientific revolution of the twentieth century (after the relativity theory and quantum mechanics).[14] Mechanistic-materialistic science started from the assumption that the world is logical and predictable and, in particular, that it essentially is a dead mechanical process. Science aimed to reduce living phenomena—the organic, the consciousness, etc.—to dead processes (for example, to mechanical chemical processes). Quantum mechanics and chaos theory shake this worldview. They initiated the reverse momentum and lean much more toward a vitalist worldview. They suggest that there is life and consciousness in all kinds of phenomena that we previously considered to be dead, mechanical processes. Think of the noise on telephone lines: It proved to not be the passive effect of all kinds of mechanical factors, but to be self-organizing; it is characterized by purposefulness and a sense of aesthetics.

Perhaps the most revolutionary aspect of chaos theory is that its observations allow us to see that there is indeed a final and formal cause at work in nature. These concepts are derived from the causality theory of Aristotle and are indispensable when considering the process of causation. In a nutshell, this theory states that there are four kinds of causes: the material, the efficient, the formal, and the final. Aristotle illustrated the difference between these four causes using the metaphor of making a statue. The material cause of the statue is the matter from which it is made (without such matter, no statue). The efficient cause is the movements of the sculptor, who uses chisel and hammer to transform the stone into a statue. The formal cause is the idea or form of the statue as it has taken form in the mind of the sculptor and determines how he will direct his movements. The final cause is the intention to make a statue (for example, because someone has ordered a statue from the sculptor). It is clear that, within a mechanistic worldview, only the material and the efficient cause are considered to be active. Once upon a time, the mechanistic universe, as a collection of material particles, set itself in motion, and all the rest followed from the initial movement of the particles. So the particles in themselves are the material cause; their movements, which generate all kinds of effects, are the efficient cause. However, within such a worldview, it cannot be presumed that certain "forms" or "ideas" exist in advance (those of certain organisms, for example) that would influence the way the material process unfolds.

Chaos theory proves that such forms *do* exist and that they operate in a coordinated manner. What has been demonstrated with the noise on telephone lines and drops dripping out of faucets can be broadened to a much larger scope. Chaos theory shows us that the mountain landscape that transports us in breathless admiration is not simply the effect of a lifeless mechanistic process—accidental mechanistic processes between tectonic plates, erosion, and eruptions of lava—but that a timeless and sublime idea coordinated the myriad of mechanical processes involved in its formation. Chaos theory heralds, maybe even more than quantum mechanics, the era that historically and logically follows the Enlightenment; an era when the universe is once again pregnant with meaning.