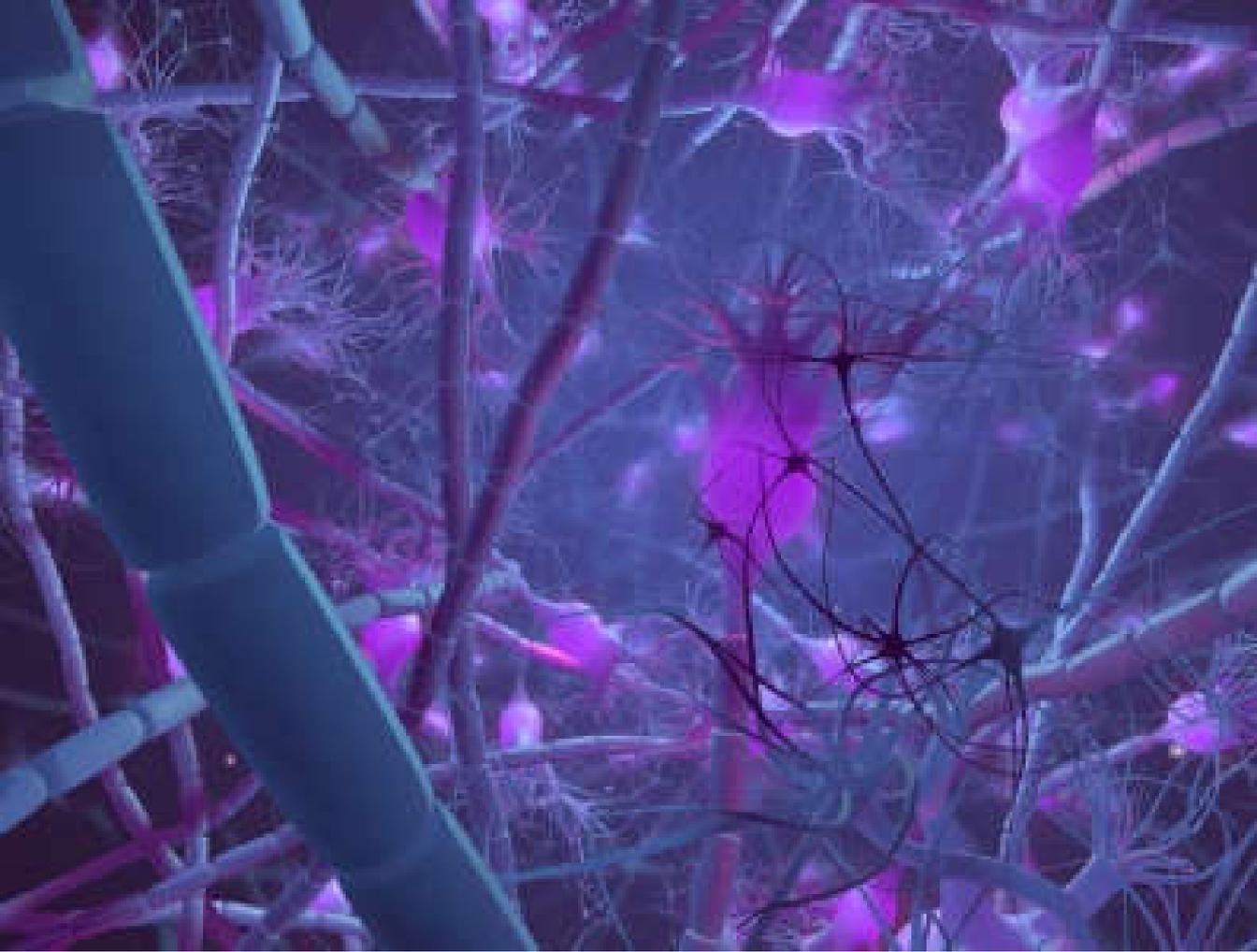


Chapter 2

Intelligence or chaos – the teleological argument

“The numerical coincidences (necessary for an anthropic universe) could be regarded as evidence of design. The delicate fine tuning in the values of the constants, necessary so that the various different branches of physics can dovetail so felicitously, might be attributed to God. It is hard to resist the the impression that present structure of the universe, apparently so sensitive to minor alterations in the numbers, has been rather carefully thought out.”

Paul Davies PhD, physicist



3D illustration of neurons (brain cells) and nerve synapses in the human brain, the most complicated organ of the human body. The human brain consists of an average of 100 billion neurons and the human body consists of about 75 trillion cells. The complexity and the organizational level of the human body and brain are indescribable. But even the structure of the smallest atom, the hydrogen atom, appears to have a complexity and a structured balance that cannot be comprehended. From the smallest sub-atomic particle, up to the living organisms and clusters of Milky Way systems, the universe is permeated with an indescribable level of organised complexity.

The first atheistic proposition: complexity is the result of chance and chaos

Most committed and outspoken atheists come from the world of science and philosophy. Dawkins and Baggini for instance, are considered to be authoritative academics. They believe in the scientific method and they often consciously position themselves as being completely opposite religion— which they call ‘superstition’ – to show that *they* represent reason. They suggest that religion belongs to the realm of emotions and feelings, where people can vent the thought that they ‘feel that there has to be something more’. They are firmly convinced that there is no, and that there cannot be any rational or scientific foundation for the proposition that the universe arises from and is governed by an intelligent power.

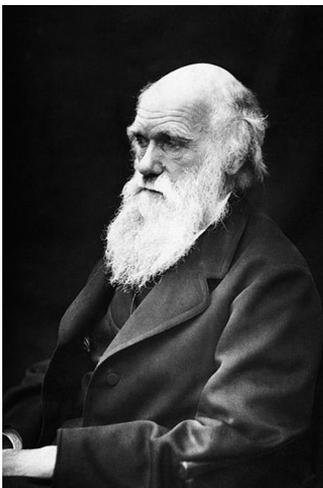
They are wrong though. First of all, the idea that religion is simply based on superstition and lacks a rational and scientific basis displays a lack of knowledge about world religions. For instance, the Vedanta tradition from India, from which Hinduism and indirectly Buddhism arose thousands of years ago, has a distinguished history of philosophical, rational and scientific inquiry into the nature of the Universe and God. According to Vedanta philosophy, there are three valid methods of obtaining knowledge, sense perception, logic and the mystic experience. The first two, sense experience and logic, are not different from the scientific method. Other religious traditions too have produced great philosophers and scientists, whose contributions to the development of human knowledge have been massive.

Secondly, scientific developments have gone through a dramatic transformation in recent decades, a so-called paradigm shift. This transformation is ignited by an increasing number of scientific indications that the universe is unimaginably complex, and that this complexity is permeated with even more unprecedented complexity. Scientific, mathematical and logical analysis of this complexity confirm that it is impossible that this complexity could have arisen by pure coincidence.

At this point, I would like to re-emphasize that although I present a particular vision with reference to the existence of God throughout this book, this vision is solely founded on scientific and rational arguments. That is not to say that the presentation of rational arguments in favour of the existence of God has not been done before. The Christian theologian and Church Father Thomas of Aquino (1225 - 1274) was one of the first Western and Christian thinkers that came up with rational arguments to prove the existence of God. Before his time, this was not considered necessary. After all, the Bible was the word of God in which God announced Himself, presented Himself, and revealed Himself. That was enough. However, as philosophy and theology developed to more sophisticated levels by the 13th and 14th centuries, it became a practical consideration to prove the existence of God with other arguments than simply Biblical Revelation. Thomas of Aquino succeeded remarkably in this regard. Even though not all of his arguments are equally as strong, there is, however, one argument that still holds to this day: the theological argument, or the argument of design.

In Western philosophy the concept of teleology was first propounded by Plato and Aristotle. Teleology literally means purpose or goal. The teleological argument therefore states that many natural phenomena, including living organisms, show signs of design and purpose. Thomas stated that these natural phenomena manifest a purposefulness, cleverness and complexity that inevitably refers to an intelligent designer. Later philosophers discussed this argument in more detail, similarly referring to the complexity of nature and the complexity of living organisms, such as plants, animals and people. Such skilled complexity, so the reasoning went, could only be explained by an intelligent creator, a designer. The modern version of teleology is far more sophisticated. Our scientific knowledge of the universe, of matter and of the structure of living organisms has vastly increased in comparison to the level of knowledge that existed at the time of Thomas of Aquino or of the 18th and 19th century scientists and thinkers.

The teleological argument categorically opposes the first atheistic proposition, that the universe arose from chaos, is governed by chaos, and that its apparent symptoms of design are the result of pure coincidence. The teleological argument states the opposite: the symptoms of design are the result of design, as are the apparent symptoms of chaos. Chaos and coincidence do not exist; everything is subject to an all-pervading, infinite intelligence. The crucial question is which argument is supported most by contemporary scientific insights. In this chapter and the following chapters I will show that the recent developments of science powerfully support the teleological argument in a way that would not have been possible thirty years ago. The logical consequence is that the alternative, which is chaos and coincidence as ultimate creators, is losing its persuasiveness.



Charles Darwin

Until Charles Darwin (1809 - 1882) published his work, the teleological argument was the absolute winner. Darwin suggested, however, that evolution—not design—and natural selection and coincidence were the driving forces behind creation, particularly the creation of life on earth. Complex organs and

smart functioning biological systems were the result of accidental mutations that led to an improved chance of an organism's survival. Design was just appearance whilst coincidence and evolution were reality. Evolution became a revolution. Many historians and scientists believe that no other scientific theory has changed the thought of man as dramatically as Darwin's theory of evolution. And so it seemed for a long period of time, until something changed several decades ago. New scientific insights, such as the discovery of DNA and the rise of molecular biology—but also the rise of new physics and the subsequent discovery of cosmic fine-tuning—revealed a universe of an unimaginable complexity. Scientists uncovered a complexity of unimagineable depth that not only manifested itself at a biological level in living organisms but also in the smallest structures and building blocks of the universe, such as atomic and sub-atomic particles. In the end this complexity is driven by the fundamental forces in the universe, and their values and delicate interactions have completely mystified scientists. These insights have led to the understanding that the universe must be a delicately balanced system, the so-called 'fine-tuned' universe. Fine-tuning implies that the basic forces of the universe are in a precise equilibrium, making possible the basic structures of matter, such as the very minuscule complex structures of atoms and molecules. Even minimal deviations from this equilibrium would make the existence of a hydrogen atom and the other elements of the periodic system impossible.

Another very important scientific development in relation to the teleological argument was the formulation of the big bang theory. This theory became the dominant theory regarding the existence of the universe in the 1950s and 1960s. Apart from the details and the mechanism of the big bang, the most important insight was the fact that the universe had a beginning. This insight enhanced the teleological argument since it enforced the statistical, mathematical arguments against coincidence and chaos. Coincidence and chaos were robbed of the eternity in which all improbabilities and impossibilities could become reality.

The scientific discoveries of the last 100 years have brought about a change in the direction of scientific thought. This direction used to tend toward materialism and ultimately atheism, but we currently see a clear change in direction. The teleological argument, nowadays embodied in the Intelligent Design school and similar schools of thought, is making a comeback and is clearly gaining momentum. And this is not because passionate fanatics are somehow getting lots of media attention. On the contrary, the amount of media attention that promotes materialism is far greater than that for Intelligent Design. Intelligent Design is gaining strength because its arguments are impressive and convincing, especially the mathematical arguments regarding complexity (which will be dealt with in detail later and which are very powerful indeed). Even those who cannot appreciate the conclusions of these arguments have to acknowledge them, implicitly or explicitly, since mathematics is an exact science that leaves little room for interpretation. Contrary to what is often assumed, namely that a spiritual worldview belongs to the realm of feeling, intuition, and non-rational thinking, this book will demonstrate that the spiritual worldview has a completely rational foundation. Moreover, it will show that the atheistic worldview itself is based on irrational core assumptions and has a dogmatic tendency towards a biased conclusion.

As stated previously, a number of very important scientific discoveries have been made in the past 100 years that have brought about this change in thinking. During the last 50 years, these developments have accelerated. The enormous technological progress in scientific research is the foundation of these developments. Advanced technology enables man to look deeper into the universe, both the micro-

universe of the atom as well as into the macro-universe of infinite space. As scientists penetrate deeper and deeper into reality, it has become increasingly apparent that underneath the surface of our 'ordinary' reality there exists an extraordinary reality. This reality is unimaginably complex and organized, where the laws of time and space behave quite differently and where paradoxical contradictions exist simultaneously in mysterious ways. Mathematical analyses determining the level of complexity are impressive. Supported by the discovery of the microchip and the development of very fast computers, mathematicians have seriously improved and accelerated their work in the area of probability and statistical analyses. The result of these analyses is baffling and is bad news for atheist materialists: Coincidence could not have been the ultimate causal factor in the origin and the maintenance of the universe as proposed by the theory of evolution and the doctrine of materialism.

Below is a short summary of the most important scientific discoveries that have contributed to these insights:

1. *The discovery of the subatomic universe by Rutherford in 1911. Rutherford was the first to describe the atom as a mini solar system with a core, orbited by electrons.*
2. *Albert Einstein's formulation of the special and general relativity theory in 1905 and 1917, respectively.*
3. *The discovery of nuclear energy based on the world-famous formula $E = mc^2$, part of Einstein's special relativity theory.*
4. *The formulation of the quantum theory and quantum physics in the 1920s by Max Planck, Niels Bohr and Werner von Heisenberg.*
5. *The discovery of the expanding universe by the astronomer Edwin Hubble in 1927.*
6. *The development of the atomic bomb in 1945 by the United States of America. This development was founded on the formula $E=mc^2$ and was preceded by research primarily by German scholars in the 1930s. Oppenheimer was the atomic scientist leading the Manhattan project that succeeded in manufacturing the first working atomic bomb in 1945. The philosophical, scientific, political and social consequences of this invention are enormous.*
7. *The discovery of the DNA molecule in the nucleus of living cells. This discovery revealed the unimaginable complexity of a living cell and showed it to be a very complex chemical factory. This discovery was made by James Watson and Francis Crick in 1953.*
8. *The formal conclusion of the big bang theory as the most likely explanation for the origin of the universe. Hubble's discovery regarding the expansion of the universe heralded the big bang theory. This conclusion became definite based on the discovery of the background radiation by Wilson and Penzias in 1965.*

9. *The formulation of the anthropic principle by Brandon Carter in 1974. Carter stated that the universe is an incredibly balanced system, from the smallest subatomic structures all the way up to huge star systems.*
10. *The formulation of the theory of the 'punctuated equilibrium' by Gould and Eldredge in 1972. According to this theory, the Darwinian model of the gradual development of the species is incorrect when one considers the fossil record.*
11. *The publication by Roger Penrose in 1989 in which he formulated his calculations regarding the probability of an anthropic (balanced) universe. Penrose based these calculations on the second law of thermodynamics, which is the law of entropy. Based on these calculations it became clear that a universe that came into being by coincidence is statistically impossible.*
12. *In general, in the 1980s many scientists started to realise the huge complexity of the universe and they started to realise that the fine tuning of the universe could not have come into being just by coincidence. Even atheist scientists such as Fred Hoyle reconsidered their atheist points of view. The Intelligent Design theory was founded on this development. However, quantum physics and the relatively theory—the so-called new physics—also reveal a universe that is energetically, mysteriously, extremely complex, and which no longer conformed to mechanical models.*

These scientific developments are the most important ones from a range of discoveries that all paint the same picture of the universe: the universe is permeated by an unimaginable level of complexity. What is interesting is that these developments cover a broad range of scientific disciplines such as physics, biology, cosmology, and mathematics; and they all confirm the unprecedented level of organized complexity and the unexplainable level of a delicate balance in the universe. In this way, science has become an important tool in a rational support for the teleological argument, and therefore, in favour of the existence of God. While Thomas of Aquino lived in the dark Middle Ages, we currently have an unmeasurable amount of information at our disposal to which we have almost instant access just by turning on the computer. This information is the result of hundreds of years of scientific research, research we have been able to finance from our increasingly prosperous economies. The scientific knowledge we have gained from it has become the foundation for a number of pioneering insights. These insights are not new, but through science, they can be visualized much more easily, and as such become more invasive and probing.

Unimaginable complexity

As stated above, one of the most important new scientific insights of the last 50 years is the presence of an unprecedented level of organized complexity in the universe. This complexity can be found everywhere and *at every level*, from sub-subatomic structures to biological organisms to mega-galaxies. Organized complexity is also the core of the teleological argument. Over the years many distinguished scientists and philosophers have agreed with the notion of teleology. As an illustration of this I herewith offer some quotes from a number of famous scientists. Philosopher and Jesuit Robert Spitzer wrote the following in his praised book *New Proofs for the Existence of God*:

*"In the absence of a natural explanation of this extremely improbable reality, many physicists concluded that our universe is influenced by a supernatural, creative intelligence."*¹

He reached this conclusion based on calculations in which the complexity of the universe was determined.

Chandra Wickramasinghe, professor of applied mathematics and astronomy at the University College Cardiff in Wales, commenting on the inconceivable complexity of living organisms, said the following:

*"The likelihood of the formation of life from inanimate matter is 1 to a number with 40,000 noughts after it ($10^{40,000}$).... It is big enough to bury Darwin and the whole theory of evolution. There was no primeval soup, neither on this planet nor any other, and if the beginnings of life were not random, they must therefore have been the product of purposeful intelligence"*²

The famous scientist Sir Fred Hoyle (1915-2001) remarked about these improbable numbers:

*Indeed, such a theory (that life was designed in an intelligent way) is so obvious that one wonders why it is not widely accepted as being self-evident. The reasons are psychological rather than scientific.*³

Another observation by Fred Hoyle, who gave up his atheism based on these and comparable facts:

*"A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question."*⁴

Atheists like Dawkins acknowledge this problem, but they believe to have found a solution for this. This solution means that since each finite life span of the universe would be insufficient to let coincidence do its job, this finiteness should be eliminated. The multiversum theory is the perfect solution in his opinion. According to this theory (which will be discussed later in this chapter in more detail), there is not just one universe with an accompanying big bang, but an infinite number of universes

and big bangs. Therefore the statistical chance that some universe out of an infinite number of universes will succeed in producing high levels of organized complexity by pure chance, has become a theoretical possibility. Cosmology professor Martin Rees comes up with the following argument in his book *Just Six Numbers*:

*"If one does not accept the 'providence' argument, there is another perspective, which - though still conjectural - I find compellingly attractive. It is that our Big Bang may not have been the only one. Separate universes may have cooled down differently, ending up governed by different laws and defined by different numbers. This may not seem an 'economical' hypothesis, - indeed, nothing might seem more extravagant than invoking multiple universes - but it is a natural deduction from some (albeit speculative) theories, and opens up a new vision of our universe as just one 'atom' selected from an infinite multiverse."*⁵

According to the multiversum theory, reality consists of an infinite number of universes that came into being through an infinite number of big bangs. These big bangs could be part of a series of successive big bangs and 'big crunches' that occur serially or that occur in parallel in parallel universes. They may also occur both serially and in parallel. The key point according to this theory however, is that the number of big bangs is infinite. Therefore, an infinite number of big bangs leads to the creation of an infinite number of universes and a corresponding increase in the statistical probability that at least one universe has just the right circumstances to create complex structures, including biological structures and living organisms. The adherents of the multiversum theory believe that without the limitation of the finiteness in time, the impossible becomes improbable; the improbable, probable; the probable, possible; and the possible becomes a fact. And it has happened here, for we are discussing it at this moment, as Dawkins said strikingly:

*"So, the sort of lucky event that we are looking at could be so wildly improbable that the chances of its happening, somewhere in the universe, could be as low as one in a billion billion billion in any one year. If it did happen on only one planet, anywhere in the universe, that planet has to be our planet, because here we are talking about it."*⁶

There is, however, one major problem regarding the multiversum theory that adherents such as Martin Rees frankly admit: it can never be empirically proven. The reason is very simple: all these parallel universes will exist fundamentally in different dimensions, with other laws of nature in another time-space continuum. We will never be able to observe them and, as Rees states, we can only conclude that they exist by means of assumptions and derivations. Therefore, such an approach completely undermines the empirically based scientific approach that atheists claim to be the foundation of their theories and arguments.

The anthropic principle

Reality: too good to be true

Materialism states that the complexity and the appearance of design in the universe are the result of arbitrariness and chance. This arbitrariness concerns the infinite amount of basic subatomic material particles that arbitrarily connect and interact with each other within infinite empty space. This is the pluralistic universe referred to in chapter 1, which entails the notion of material particles residing in and separated by empty space. These interactions are guided by a number of basic forces, of which the four forces gravity, electromagnetism, and the strong and weak nuclear forces are the most important. These forces are expressed in the laws of nature, but physicists acknowledge that these laws are blind towards each other. It is important to note that many of the fundamental forces in nature, particularly the four forces referred to above, are constants. A constant in physics is defined as a force that exists independent of any other force, and has the value that it has, i.e. its value has no known cause. It is for this reason that balances of these values in relation to one another is so extremely mystifying, precisely because they have no cause. They are what they are, and they happened to be just right as we shall see. The forces that regulate the micro structures of the universe such as sub-atomic, atomic and molecular structures, are also referred to as the fine-structure constants. Consequently the forces that regulate the macro structures of the universe, such as planets, stars, solar systems or galaxies are called the large-scale constants.

A key element of materialism is the assumption that the chance interactions of basic material particles is an evolutionary process that takes place over vast amounts of time, whereby based on statistical probabilities, they are literally given the time and space to come up with usefull structures. This point of view, namely the idea that arbitrary interactions between fundamental material particles and natural forces over a long period of time lead to strongly organized and complex structures by coincidence, is called the random universe. The supposed evolutionary process of primordeial material particles is not to be confused with the Darwinian evolution of living organisms, although on a deeper level there is an important similarity. Both types of evolution refer to the emergence of new properties that were not present in their constituent components. This evolutionary vision has become a central part of the materialist version of modern science. However, in recent decades, scientists have discovered that fine tuning did not take place over billions of years of evolution and gradual development. Rather, the universe had to be fine-tuned from the very first fraction of a fraction of a second of the big bang. It was literally instantaneous.

The famous astronomer Fred Hoyle describes the big bang and the creation of basic structures of matter as follows:

"All that we see in the universe of observation and fact, as opposed to the mental state of scenario and supposition, remains unexplained. And even in its supposedly first second the universe itself is acausal. That is to say, the universe has to know in advance what is is going to be before it knows how to start itself. For in accordance with the Big Bang Theory, for instance, at a time of 10^{-43}

*seconds the universe has to know how many types of neutrino there are going to be at a time of 1 second. This is so in order that it starts off expanding at the right rate to fit the eventual number of neutrino types.*⁷

This is a bewildering conclusion; the big bang essentially created a perfectly balanced universe in milliseconds. To try to grasp the extraordinary nature of this situation let us consider how the values of the four basic forces of nature – gravity, electromagnetism, and the weak and strong nuclear forces, are interacting, a topic which has totally mystified scientists. The values of these constants are of major importance, since scientists have determined that small changes in these values would change the entire universe. Moreover, these small changes would mean that, in almost all cases, the existence of the universe would be impossible, or that it would lead to a universe consisting solely of black holes, or a universe with one enormous black hole, or a universe without hydrogen, which would make the existence of higher forms of life and very complex organic structures impossible. In other words, the constants of the universe seem to exist in such a way and seem to be balanced in such a delicate manner that they have made the existence of the universe with its atoms, molecules, chemical elements, solar systems and star systems and, in the end, living organisms possible. This principle of the fine-tuned universe was described for the first time by astrophysicist and cosmologist Brandon Carter of Cambridge University during a lecture in Poland in 1974. He called this characteristic of the universe the anthropic principle, derived from the Greek word *anthropos*, meaning human. Carter said during this lecture that the different laws of nature seemed to be composed from the beginning in such a way that life and humanity could exist. The anthropic principle is the result of the underlying principle of cosmic fine-tuning. Cosmic fine-tuning applies to every aspect of the universe from its inception, such as time, space, primordial matter and energy, the anthropic principle zooms in to the fact the fine-tuning has enabled the appearance of intelligent life in the universe.

Cosmic fine-tuning and the subsequent anthropic principle are perfect examples of the teleological argument and in many respects define it. Fine-tuning can be considered to represent the first phase of a teleological universe; it establishes that the basic structures of the universe, such as the atomic and the subatomic particles, can exist only by the grace of the delicate balance of the four fundamental forces. Prior to the discovery of fine-tuning, it was more or less assumed that the building blocks of matter were relatively simple. Newton for instance assumed that atoms were simple, indivisible particles made of pure matter. The discovery of radiation and sub-atomic particles at the end of the 19th century shattered this notion of simple and indivisible atoms. Further research showed that atoms were complex little universes held together by fine-tuned forces. Scientists have furthermore discovered that slight changes in the values of these forces in relation to one another would lead to an unworkable mess.

Scientists distinguish between the strong anthropic principle and the weak anthropic principle. The weak anthropic principle is simply the acknowledgment that biological life-forms can only exist in very specific and balanced circumstances. Adherents to the weak anthropic principle tend towards the multiversum theory as the explanation for the very improbable circumstances that have led to our existence. On the other hand, the strong anthropic principle states that a naturalistic explanation for the anthropic circumstances of the universe are mathematically and statistically impossible. The fine-tuning of the universe demands a different explanation that will be elaborated on in the following paragraphs and chapters.

In his book, *God, the Evidence*, Patrick Glynn gives a number of examples of the consequences of small changes in the values of the constants in relation to each other:

- *Gravity is roughly 10^{39} times weaker than electromagnetism. If gravity had been 10^{38} times weaker than electromagnetism, stars would be a billion times less massive and would burn a million time faster.*
- *The nuclear weak force is 10^{26} the strength of gravity. Had the weak force been slightly weaker, then all the hydrogen in the universe would have been turned into helium (making water impossible, for example)*
- *A stronger nuclear strong (by as little as 2 percent) would have prevented the formation of protons yielding a universe without atoms. Decreasing it by 5 percent would have given us a universe without stars.*
- *If the difference in mass between a proton and a neutron were not exactly as it currently is – roughly twice the mass of an electron – then all neutrons would have become protons and vice versa. Say good-bye to chemistry as we know it – and to life.*
- *The very nature of water – so vital to life – is something of a mystery (a point noticed by one of the forerunners of anthropic reasoning in the 19th century, Harvard biologist Lawrence Henderson) Unique among the molecules water is lighter in its solid form than liquid form: ice floats. If it did not, the oceans would freeze from the bottom up and earth would now be covered with solid ice. This property in turn is traceable to unique properties of the hydrogen atom.*
- *The synthesis of carbon - the vital core of all organic molecules – on a significant scale involves what scientists view as an “astonishing” coincidence in the ratio of the strong force to electromagnetism. This ratio makes it possible for carbon-12 to reach an excited state of exactly 7.65 MeV at the temperature typical of the center of stars, which creates a resonance involving helium-4, beryllium-8 and carbon-12, allowing the necessary binding to take place during a tiny window of opportunity 10^{17} seconds long.*

The list of these so-called coincidences goes on and on and is completely mystifying. The famous physicist Leonard Susskind writes in his book *The Cosmic Landscape* the following about this topic:

"Some (cosmologists) only see a series of remarkable consequences:

- *The universe is a fine-tuned thing. It grew by expanding at an ideal rate. If the expansion had been too rapid, all of the material in the universe would have spread out and separated before it ever had a chance to condense into galaxies, stars and planets. On the other hand, if the initial expansion had not had a sufficient initial thrust, the universe would have turned around and collapsed in a big crunch much like a punctured balloon.*

- *The early universe was not too lumpy and not too smooth. Like the baby bear's porridge, it was just right. If the universe had started out much lumpier than it did, instead of the hydrogen and helium condensing into galaxies, it would have clumped into black holes. All matter would have fallen into these black holes and been crushed under the tremendously powerful forces deep in the black holes interiors. On the other hand, if the early universe had been too smooth, it wouldn't have clumped at all. A world of galaxies, stars and planets is not the generic product of the physical processes in the early universe; it is the rare and, for us, very fortunate, exception.*
- *Gravity is strong enough to hold us down on the earth's surface, yet not so strong that the extra pressure in the interior of stars would have caused them to burn out in a few million years instead of the billions of years needed for Darwinian evolution to create intelligent life.*
- *The microscopic Laws of Physics just happen to allow the existence of nuclei and atoms that eventually assemble themselves into the large "Tinkertoy" molecules of life. Moreover, the laws are just right, so that carbon, oxygen, and other necessary elements can be "cooked" in first-generation stars and dispersed in supernovae.*
- *This basic setup looks almost too good to be true. Rather than following a pattern of mathematical simplicity or elegance, the laws of nature seem specifically tailored to our own existence.*⁸

The main problem is that there is not a possible explanation why the laws of nature and their constants have these exact values. Scientists have tried to explain this by attempting a theory that unites the four fundamental forces into one all-embracing unified theory, *but they have not succeeded in that so far*. It is largely the mysterious nature of gravity that undermines any attempt to unify them. However, even if there was a successful unified theory, it would not explain the 'why' of this arrangement in a mechanical and causal manner. Therefore, some scientists have sought their refuge in the existence of parallel universes—in other words, in the multiversum theory. By means of this theory, they try to explain the amazing coincidence of the anthropic principle. We will discuss this 'apparent solution' in more detail at the end of this chapter.

The Statistical Probability of Chance Creating a fine-tuned universe

Jesuit and philosopher Robert J. Spitzer explores the anthropic principle in depth in his aforementioned book *New Proofs for the Existence of God*. First of all, he calculates the so-called probabilistic resources of the universe from the big bang up to the present. These probabilistic resources consist of the total number of subatomic particles in the universe multiplied by the total number of units of time in which these particles can accidentally interact with each other. Despite the huge size of these numbers, this is a comprehensible approach to a probability based cosmic theory.

These resources are the following:

1. *The total number of protons and neutrons in the universe being 10^{80}*
2. *The total number of seconds that have passed since the big bang being 10^{16}*
3. *A maximum of 10^{43} interactions can take place per second, the so-called unit of time devised by Planck. This means an entropy per particle of 10^{43} .*
4. *The total entropy of the universe therefore amounts to 10^{123}*

Spitzer based his calculation on the work by the renowned British mathematician and physicist Roger Penrose, who carried out an analysis of all the possible universes that could have been created at the moment of creation.

The term ‘entropy per particle’, as used by both Spitzer and Penrose in their calculations, means the number of possibilities per unit of time in which the particles can relate to each other in an arbitrary, chaotic way. Literally, entropy means disorder or chaos. Entropy and the anthropic principle are each other’s enemies. Organized complexity, which is the essence of the anthropic principle, is the exact opposite of entropy. According to the second law of thermodynamics, which is the law of entropy, complex structures always tend towards simple, chaotic structures because of the process of disintegration. Entropy also implies that natural processes are basically irreversible and will only move in one direction over time. For example, when someone drops a wine glass on a stone floor, it will smash into hundreds of pieces. In this event, it is highly improbable that the pieces will spontaneously combine into a glass again. In other words, the glass is a complex structure which has to be carefully looked after in order to maintain its structure and not break apart into smaller and smaller pieces thereby increasing degrees of chaos and randomness.

Within this frame of reference, entropy has everything to do with probability: complex structures are not probable—the greater the degree of complexity, the more improbable it is that the structures come into being spontaneously. Chaos and simplicity are, therefore, comparable concepts. They both refer to a situation in which objects will find the least difficult and simplest structure in relation to each other.

This tendency towards simplicity and non-organized structures is called entropy and is characterized by the irreversibility of the process. Complicated structures become simple spontaneously whilst simple structures do not spontaneously become organized and complex.

At this point it is important to dwell on the concept of entropy a bit more, and to understand the underlying philosophy that determines the principle of entropy within the context of atheism and materialism. Critical to entropy is the notion that the universe fundamentally consists of two realities, particles of matter and the void. While these two realities co-exist in the same universe, they are fundamentally separated from each other since the void, in order to be truly void, is completely empty and does not possess any properties at all. Therefore the void is not able to influence the particles of matter, and thus these particles exist independently of one another. In the previous chapter this has been labelled pluralism, when defining the first of the four atheistic propositions. The material particles can only influence one another if there is direct physical contact. This physical interaction and the rules that govern these physical interactions lies at the core of Newton's laws of mechanics. However, Newton's laws are simple and one-dimensional; every physical contact results in an opposite identical reaction. Therefore, while material particles interact, they remain independent and their motion in empty space remains random in relation to one another. These random motions create a situation whereby every combination of particles is inherently unstable. Entropy could be described as the direction towards the state where the independent particles exist in the simplest possible combination in relation to each other. This would be an eventual state of rest, whereby all material particles are evenly distributed in empty space. This would take place when the original energy that put all particles in motion in the first place, would eventually be depleted, caused for instance by frictional losses of energy in due course of time. This is indeed one of the scenarios described by cosmologists when dealing with the ultimate future of the universe, the Big Rip scenario where eventually all matter will come to a standstill in a state of absolute zero temperature.

Atheism, which fundamentally embraces pluralism, inevitably struggles with entropy. Entropy does not allow for complex and stable structures to exist perpetually, no matter how much 'chance', 'coincidence' and 'randomness' we interject in the interactions of material particles. While we do observe that entropy exists on one level in the universe, referring to the example of the wineglass above, on another level we find that the universe displays levels of organized complexity that are anthropic in nature, and anti-entropy. Countless examples can be provided of the precise correlation required between the values of the constants, such as the list of coincidences provided earlier in this chapter. All of these coincidences refer to a fine-tuned and anthropic universe. This contradiction between entropy and anthropy exists, because the philosophical and scientific notion of a pluralistic universe is fundamentally flawed and incorrect.

over again.” The fact is that these arguments have been presented before and they remain as powerful today as they did back then. What is new, however, is the discovery of the principle of cosmic fine-tuning, the subsequent anthropic principle and the magnitude of the mathematical consequences of these principles. Spitzer did pioneering work and the title of his book *New Proofs for the Existence of God* justifies its contents. The discovery of physical constants, especially the four fundamental forces, have given the teleological argument an entirely new strength. In addition to the four fundamental forces, Spitzer describes a large number of other constants, 21 in total, which all have precisely the correct values to make the anthropic universe possible. These other constants are the speed of light; Planck’s constant (the smallest unit of time); various relation ratios such as those of photons and neutrons; the mass of electrons and protons related to each other; and constants that regulate the large structures and small structures of the universe, such as Hubble’s constant, Boltzmann’s constant, the cosmological constant, the cosmic ratio between photons and protons, the amount of free space, the electromagnetic fine-structure constant, the weak fine-structure constant, and the gravity fine-structure constant. The key and fundamental point is that each of these constants could have had any other arbitrary value, but the value they do have is exactly the right value in relation to each other and to the total, such that the creation of a fine-tuned and anthropic universe has been made possible. The fine-tuning of all these forces and constants with respect to one another is so extremely accurate that the conclusion is an inescapable fact. Chance and chaos, after a once glorious and promising career, are now relegated to the dustbin of the history of discarded and unworkable theories.

Life, the cherry on the cake

The presence of amazingly complex structures

The second phase of the teleological argument relates to the existence of amazingly complex structures, in particular that of living organisms. This is called the second phase because the first phase relates to the fundamental structures of the universe, such as atoms, atomic and molecular compounds, energy and force fields, planets, solar systems, and star systems. The second phase relates to that which is created with the assistance of and from these fundamental structures, such as the structures of living organisms. The human body contains, for example, about 75 trillion cells, of which each cell is a chemical factory of unimaginably complex proportions. The nucleus of the cell consists of DNA, an amazingly complex molecule that is responsible for the functioning of the cell. DNA can be compared to a computer code, in which instructions are laid down that determine the functioning of the cell and the entire organism. Except that the DNA of a living cell is so complicated that it would need an encyclopaedia of a thousand volumes to write it out. If you were to lay down the DNA strings of one person in their full length, they would be as long as the distance from earth to the moon—400,000 kilometres—and then 3,000 times back and forth; a total of 2.4 billion kilometres!¹⁰



3D illustration of a DNA molecule

Another example of the unimaginable numbers that characterise the structure of cells is the number of hydrogen atoms in one human cell. One human cell contains an estimated 3,000 trillion (or 3^{15})

hydrogen atoms that are all linked and coordinated together in an unimaginable, complicated way. All this happens to create one living cell and to keep it alive. The human body is therefore an unimaginably complex system. No amount of superlatives will do justice to this phenomenon. This complexity can only be expressed with the assistance of abstract mathematical and statistical representations of indescribably large numbers.

The common scientific explanation is still that living cells have come into being from matter coincidentally, after millions of years of evolution. This assumption—that complicated organic structures can arise from simple, non-organic structures coincidentally—is the cornerstone of the theory of evolution. The question, however, is whether such Complex Specified Information, or CSI, can be produced by pure coincidence, at least at the level described above. CSI is a mathematical term that describes complex structures such as machines and distinguishes it from other structures. A machine—for example, a computer—is designed and built according to a combination of many specific parts (complexity) in a specific order and structure (specification). Each machine made by man, whether it is a simple or complex machine, contains complexity and specification. However, structures that were not made by man, such as man himself, also clearly show the same characteristics of complexity and specification. William A. Dembski writes in his book *Intelligent Design* that coincidence can ‘produce either complex, unspecified information or non-complex, specified information’, but it cannot produce complex, specified information. The example he uses is of the typist who types an arbitrary row of letters. This generates complex, unspecified information that can look like the following (typed arbitrary by myself):

"hehdkjoihfdius dkjihjusjdiuyekmncxmbshsduyekjs dlksdm sdkjiuelksdlkhsdkkljsd hsduiy elk poterouweisaks dnbxcm, dlk j iuwlks adpoijfudeljksdlkjk jdyuiwpokdsnhd oosmms dojdn jhdy eiw uois dnmcxhsj kdfioeciugflhs apoxcmnskijds".

In this short, somewhat complex series of letters, nothing useful is written. There are, however, a number of meaningful, very short and therefore non-complex words—for example, the Dutch words ‘elk’ and ‘pot’ represent non-complex but specified information. Typing randomly cannot produce long, meaningful lines, or information that is both complex and specified. Dembski further explains:

*"When the complexities become too vast and the specifications too tight, chance is eliminated and design is implicated. Just where the probabilistic cutoff is can be debated, but that there is a probabilistic cutoff beyond which chance becomes an unacceptable explanation is clear. The universe will experience heath death before random typing at a keyboard produces a Shakespearean sonnet. The French mathematician Emile Borel proposed 10^{50} as a universal probability bound below which chance could definitely be precluded - that is, any specified event as improbable as this could not be attributed to chance."*¹¹

To make this clearer, this means that if the chance of a certain event happening is only one in 10^{50} (which is 10 with 50 zeros) or smaller, then the likelihood of this event taking place by pure coincidence is effectively an impossibility. Consequently, if this event has indeed taken place, we can conclude that it was not by coincidence.

Using Borel's probability limit as a gauge we can see that the probabilities for even the most basic elements of a living organism to have occurred by chance are so small that they are several orders of magnitude beyond any probability and therefore such a hypothesis has to be completely rejected. Robert Shapiro, a chemistry professor of New York University and a DNA expert, has calculated what the probability is that 2,000 types of proteins can form coincidentally in one bacteria (considering there are 200,000 different kinds of proteins in one human cell). The number that expressed this chance is $10^{40,000}$, which is 10 followed by 40,000 zeros.¹² Chandra Wickramasinghe, professor of applied mathematics and astronomy of the University College Cardiff in Wales, says the following:

*"The likelihood of the formation of life from inanimate matter is 1 to a number with 40,000 noughts after it ($10^{40,000}$).... It is big enough to bury Darwin and the whole theory of evolution. There was no primeval soup, neither on this planet nor any other, and if the beginnings of life were not random, they must therefore have been the product of purposeful intelligence"*¹³



Sir Fred Hoyle

The famous scientist Sir Fred Hoyle says about these improbable numbers:

*Indeed, such a theory (that life was designed in an intelligent way) is so obvious that one wonders why it is not widely accepted as being self-evident. The reasons are psychological rather than scientific.*¹⁴

The biologist Stephan C. Meyer says the following about the chance that life came into being by coincidence in his book *Signature in the Cell*:

*"The complexity of the events that origin-of-life researchers need to explain exceeds the probabilistic resources of the entire universe. In other words, the universe itself does not possess the probabilistic resources necessary to render probable the origin of biological information (and therefore life) by chance alone."*¹⁵

The mathematician Richard Thompson has calculated that the appearance of higher life-forms based on the theory of probability is impossible, with even more extreme numbers as its result:

*"Over periods many times the estimated 4 to 5 billion year age of the earth, the probability of the evolution of the higher life forms remains bounded by upper limits of $10^{150,000}$, an almost infinitesimal number. This implies that the entire history of the earth would have to be repeated over and over again at least $10^{30,000}$ times for there to be a substantial chance that higher living entities would evolve even once".*¹⁶

Thompson's calculations and their conclusions therefore suggest an improbability that is $10^{149,950}$ higher than the point that Borel proposed. All these calculations go far beyond the probability limit; they are impossible. This is very important, both scientifically as well as regarding our common sense. Try to imagine the number we are referring to: $10^{150,000}$ times 4 billion is the same as 10 followed by 150,000 zeros to be multiplied by 4 billion.

Adherents to the theory of evolution have so far been able to hide behind what are unimaginable units of time for normal people, such as the fact that the earth is four billion years old. However, it is clear that these unimaginably long units of time are just a passing moment compared to the actual time required for life to have occurred by chance based on entropic limitations and statistical probability calculations for just the simplest components for life. The fundamental basic assumption of evolution has been that in the most unimaginable time period, namely eternity, everything is possible, even the most unimaginable. The problem is, however, that whilst both the earth and the universe are indeed very old, 4 billion and 13.7 billion years old respectively, that is certainly not eternity. It is important to again keep in mind in this context that the total number of atoms in the universe is not more than 10^{80} . This is an absolutely enormous number, but compared to the number $10^{150,000}$, or the possibility that higher life forms could have evolved by chance, it becomes almost insignificant.

Richard Dawkins, advocate of the evolution theory, describes the impossibility of the theory of evolution as follows:

*"So, the sort of lucky event that we are looking at could be so wildly improbable that the chances of its happening, somewhere in the universe, could be as low as one in a billion billion billion in any one year. If it did happen on only one planet, anywhere in the universe, that planet has to be our planet, because here we are talking about it."*¹⁷

At this point, the previously mentioned multiversum theory is not able to provide a solution at all. The emergence and evolution of living organisms has to take place in this universe and depends on the available time, the entropic limitations, the probabilistic resources, and the fundamental structures of matter that are present in this universe. And as we have seen, mathematical analyses show that these are completely inadequate to make evolution possible, in the words of Stephen Meyer: "... the universe itself does not possess the probabilistic resources necessary to render probable the origin of biological information".

The multiverse as saving grace

A number of scientists have been trying for quite a while now to find a solution to the mathematical impossibility that the complex structures of the universe could have come into being by coincidence. Mathematicians state that there is effectively no period of time long enough to make the development of advanced complexity, such as living organisms, possible, and certainly not in the 13.7 billion years that our universe has existed. Moreover, the cosmic fine-tuning and anthropic principles demand that the universe is perfectly balanced from the first milliseconds of its creation onwards just for our universe to be able to function and exist the way it does. That implies that no time period would have been available to allow for some type of evolutionary development.

To tackle this problem, a number of prominent scientists have developed the multiverse theory which was discussed briefly at the beginning of this chapter. According to the multiverse theory, reality consists of an infinite number of universes that came into being through an infinite number of big bangs. Because there are an infinite number of big bangs, this leads to the creation of an infinite number of universes and therefore an increase in the statistical chance that a universe has the correct circumstances to defeat the anthropic principle. And furthermore, that it has the necessary conditions to conquer the second gigantic mathematical hindrance, which is the evolution of complex organic life from non-organic matter. The adherents of the multiverse theory believe that without the finiteness in time, the impossible becomes improbable, the improbable becomes probable, the probable possible, and the possible a fact. And it has happened here, for we are discussing it right now, as Dawkins put it so pithily.

A multiverse can come about in three different ways, either serially, parallel or both. In the serial version, several universes can come into being as the result of a cyclic process, where the big bang is followed by the big crunch. According to this theory, the big bang introduces an expansion of the universe that will come to a stop after a while. Subsequently, due to gravity, an implosion will follow that will lead to a new singularity. This is the so-called big crunch. Consequently, this singularity would lead to another big bang and so on. This cycle, a kind of 'bouncing' universe, was a fairly plausible option for a while, until cosmologists discovered in 1998 that the expansion of the universe speeds up instead of slows down. Therefore, the big rip scenario is more probable; the universe keeps expanding for ever until it basically gets ripped apart. This ripping apart will coincide with the universe freezing to death, where the temperature will reach absolute zero. The second way in which a multiverse can come about is based on the assumption that there could be an infinite number of parallel universes that exist simultaneously with and parallel to our own universe. Each of these universes could themselves go through bouncing cycles, which would then account for the third way a multiverse could exist. This is however intriguing, less relevant. More relevant is the fact that the multiverse hypothesis can be divided into a moderate and a radical version. The moderate version basically states that the multiverse consists of various domains, but each of these domains are still fundamentally ruled by the same laws of physics.

Robert Spitzer explains this as follows:

"There is much loose talk, even among physicists and philosophers, of "many universes." In all the theories we have been talking about, there is really just one universe, if we mean by the universe the entirety of physical reality that is in any way physically connected to the world we experience. In "multiverse" models, the universe has many "domains", but they are all parts of the same structure that is governed, ultimately, by one set of fundamental laws. Those fundamental laws may be realized in different ways in different domains, but the fundamental laws are the same in every domain, and the domains physically interact with each other in ways governed by those laws. Similarly, in bouncing or cyclic universe scenarios, there maybe different cycles, but all those cycles are all part of a single process governed by one set of fundamental laws." ¹⁸

With regard to the "bouncing" universe Spitzer remarks that it is highly unlikely that this bouncing cycle could go on forever::

"Is it possible that the universe has been bouncing like this forever? There are three indications that this is highly unlikely: 1) the radiation paradox 2) the entropy paradox 3) the increase in cyclic expansion. All of them are related to the second law of thermodynamics, the law of entropy. In every cycle of the bouncing universe, irreversible processes go on. For example: stars shine. They shine because they are much hotter than their surroundings, they release energy to their surroundings in the form of light. And, just as in the case of a hot cup of coffee releasing energy into its environment, this is a "thermodynamically irreversible process" - it increases the entropy of the universe. It also increases the amount of radiation filling the universe." ¹⁹

This is a very logical analysis of the multiversum theory that also exposes its weakness. The weakness is that in this version of the multiversum theory, the fundamental laws, including the law of entropy, have to be applicable to the other universes. But, if the laws of nature are the same across the various universes, then statistical strokes of luck are impossible.

As we can see, the moderate multiverse hypothesis does not solve the problem of the atheist, for he is still stuck with the laws of entropy that govern these universes. Therefore a number of scientists and philosophers have adopted a radical version of the multiverse. The radical version implores that parallel universes exist in a totally different reality, which is disconnected from our universe and its laws of physics. They exist in entirely different time-space continuums and they are not part of the multiverse or megaverse as some scientists prefer to call it. They actually exist in a completely different reality, with completely different laws of nature than ours. There is no connection with our physical, perceptible world, or our world of experience.

Cosmologist professor Martin Rees, gives the following explanation and description in his book *Just Six Numbers*:

"If one does not accept the 'providence' argument, there is another perspective, which - though still conjectural - I find compellingly attractive. It is that our Big Bang may not have been the only one. Separate universes may have cooled down differently, ending up governed by laws and defined by different numbers. This may not seem an 'economical' hypothesis, - indeed, nothing

might seem more extravagant than invoking multiple universes – but it is a natural deduction from some (albeit speculative) theories, and opens up a new vision of our universe as just one ‘atom’ selected from an infinite multiverse.”²⁰

However, there is an enormous problem regarding this radical version of the multiversum theory that adherents such as Martin Rees admit quite frankly: it can never be empirically proven. The reason for this is simple; all other universes will exist in fundamentally different dimensions, with other laws of nature in another space-time continuum. The consequence of this is that they can never be perceptible from our point of view, and therefore, factually, they do not exist. As Rees puts it, we can only conclude that they exist by means of suspicions and derivations, which means this is a purely theoretical hypothesis that lacks any empirical and scientific foundation.

But even if for the sake of argument we allow the existence of parallel universes in accordance with the radical multiverse theory, the problem would in any case not be solved. These universes would have to be entirely different from our own universe in every respect, and therefore they could not possess any features in common with our own universe. There could be no time, space, matter, energy or forces possessing certain values. Since there are no comparable forces with comparable values, statistical probabilities based on an infinite number of tries of comparable values, simply would not exist either. The whole multiverse exercise, entirely hypothetical from the outset, fails before it even begins. Yet, the radical multiversum theory is the only real argument that atheists such as Dawkins can employ against the teleological argument. They are now left empty handed as the above arguments clearly demonstrate.

Another physicist, Paul Davies, says the following about this:

“... the multiversum theoreticians admit that the ‘other worlds’ in their theory can never—not even in principle—be observed. Travel between quantum variants is prohibited.”²¹

This is a truly ironic turn of events. In the past scientists accused religious thinkers and theologians of using fundamentally unprovable hypotheses, but we now see that some scientists are seeking refuge in fundamentally unprovable hypotheses themselves, such as the existence of the multiversum. The evidence for intelligent guidance in the universe is growing stronger, while indications for chaos and coincidence as ultimate creators has become more and more improbable and the justification for this has inevitably become more and more exotic and extreme. The tables have indeed turned.

An argument that atheists use a lot is that God is the product of ignorance; ‘the God of the Gaps’, wherein “gaps” refer to the gaps in our knowledge. In this regard, the tables have also turned. First of all, this reproach is dated: the teleological and anthropic argument indicate this. However, if one does continue this train of thought, then the multiversum theory is itself more than suitable for this qualification. The multiversum theory only exists because of gaps, an infinite number of gaps. Each parallel universe is after all impossible to detect and verify—a position of structural ignorance without any possibility towards improvement. The launch of the multiversum theory as the last line of defence of atheism is a fairly desperate and remarkable attempt to save coincidence and chaos from their ultimate demise.

Complexity and intelligence

In the final analysis, the presence of organized complexity can only really be explained by the presence of consciousness and intelligence. As was elaborately indicated in this chapter, chaos and coincidence are totally inadequate as possible explanations. There is no other reality or function that can be compared to the characteristics of consciousness. Our everyday experiences and scientific insights confirm this. Yet, consciousness and intelligence are conspicuously absent from atheistic explanations of the universe. Or are they?

The atheist point of view explains organized complexity based on a combination of:

1. *coincidence, disconnected particles moving in empty and infinite space*
2. *the function of a number of simple forces of nature and laws of nature,*
3. *a mysterious self-organising ability of matter.*

Of these three functions, 1 and 2 have already been discussed and refuted by the teleological argument. Item 3, self-organization, is a vague and misleading term since self-organization is simply identical to consciousness and intelligence. Only consciousness has the ability to carry out what we call self-organization, and in later chapters the function and characteristics of consciousness will be elaborately discussed.

The remarkable aspect of the atheist point of view is that all kinds of great characteristics are contributed to the universe: substance, structures, colours, radiation, light, infinite space and time, unlimited energy, unimaginable forces and an incomprehensible ability for self-organization. These characteristics are, in the end, all part of the intrinsic characteristics of matter and energy that the universe consists of without cause. It is quite special and arbitrary that between all those characteristics the most wonderful of all is not present, which is consciousness.

Even the most imaginative science fiction writers of a century ago could not have dreamed of the characteristics of the universe, of matter, energy, time, and space as they have presented themselves now to scientists. Nevertheless, it is claimed that the universe and its origin in the singularity and the big bang are stupid and unintelligent in the end. It is even more bewildering that this stupid and unintelligent universe has produced intelligent creatures like ourselves, all purely by coincidence and against all statistical impossibilities. It implies that these intelligent creatures have now become smarter than their unintelligent creator, the Stupid Universe. This would truly be quite remarkable and strange. The main question, however, is whether it is true or not.

Given our current knowledge the proof is overwhelming. The universe— and its cause—is not stupid, but is hyper intelligent. It is so intelligent that it is even able to fool us and make us believe that it is stupid. The scientific proof that the level of complexity in the universe cannot possibly arise from chaos and coincidence is overwhelming. This is also the most important conclusion of this chapter: the

universe is governed by intelligence at all times and at every level. This intelligence is God, or at least it represents one of the most characteristic qualities of God. God has many characteristics, which we will discuss in later chapters. However, some of His most distinguishing characteristic qualities are an all-embracing consciousness and an infinite intelligence. We are all confronted with these qualities constantly and intensively.

¹ Robert J. Spitzer in 'New proofs for the existence of God'

² Chandra Wickramasinghe in Fred Hoyle and Chandra Wickramasinghe 'Evolution from Space' (Simon & Schuster, New York 1984)

³ Fred Hoyle in Fred Hoyle and Chandra Wickramasinghe 'Evolution from Space' (Simon & Schuster, New York 1984)

⁴ Fred Hoyle, 1981, cited by Robert J. Spitzer, cited in his book 'New Proofs for the Existence of God', page 73. Original quotation by Fred Hoyle: 'The Universe: Past and Present Reflections' in *Engineering and Science*, (November 1981)

⁵ Martin Rees *Just six numbers*, page 166

⁶ Richard Dawkins in 'Climbing Mount Improbable' (W.W. Norton, New York 1996)

⁷ Patrick Glynn 'God, the evidence', page 31. Here he cites Fred Hoyle in 'The Origin of the Universe and the Origin of religion'

⁸ Leonard Susskind in 'The Cosmic Landscape' page 129

⁹ Robert J. Spitzer in 'New proofs for the existence of God'

¹⁰ National Geographic documentary on the 'origin of human species', Sunday 28 May, 2006. If you take the DNA of a cell, and lay it out it would stretch 3000 times the distance (back and forth) from the earth to the moon which is 400,000 km, which is 2.4 billion km (3,000 x 800,000)

¹¹ William A. Dembski 'Intelligent Design' page 165, 166

¹² Harun Yahya in 'Darwinism refuted', page 197, where he cites Robert Shapiro 'Origins: A Skeptic's Guide to the Creation of Life on Earth' (Summit Books, NY 1986)

¹³ Chandra Wickramasinghe in Fred Hoyle and Chandra Wickramasinghe 'Evolution from Space' (Simon & Schuster, New York 1984)

¹⁴ Fred Hoyle in Fred Hoyle and Chandra Wickramasinghe 'Evolution from Space' Simon & Schuster New York, 1984

¹⁵ Stephen C. Meyer, 'Signature in the Cell'

¹⁶ Richard Thompson 'Mechanistic and nonmechanistic science'

¹⁷ Richard Dawkins in 'Climbing Mount Improbable' (W.W. Norton, New York 1996)

¹⁸ Robert J. Spitzer 'New proofs for the Existence of God'

¹⁹ Robert J. Spitzer 'New proofs for the Existence of God'

²⁰ Martin Rees 'Just six numbers'

²¹ Robert J. Spitzer 'New proofs for the Existence of God'