The Nonessential Essential

Hypothesis about the existence of a new fundamental force in nature

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A c k n o w l e d g e m e n t s

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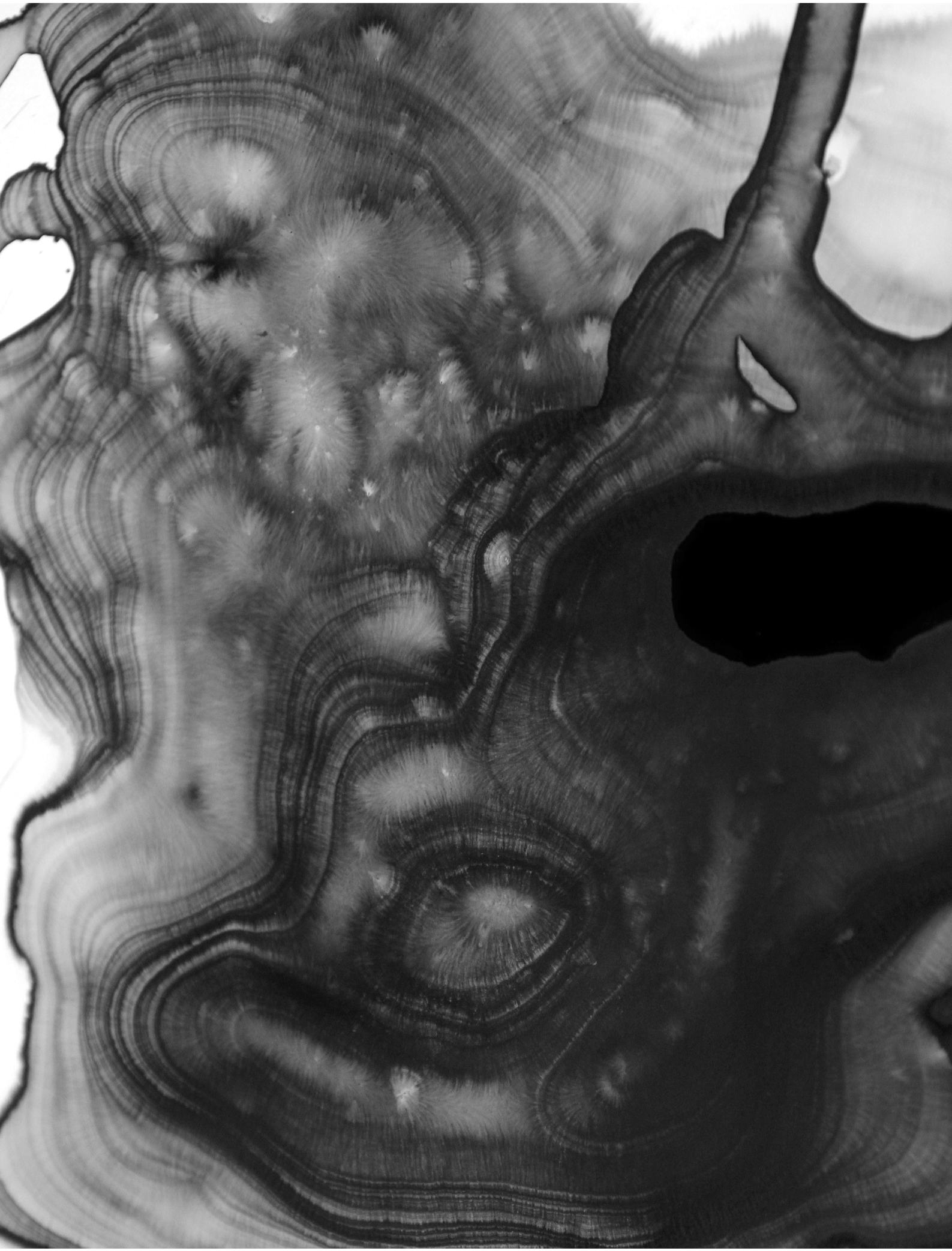
A mi tío Alejandro

I N D E X



Mi poesía puede perfectamente no conducir a ninguna parte

Nicanor Parra

My poetry might perfecly lead nowhere

Nicanor Parra

P R E F A C E

On October 12th 2018, I had a long conversation with my friend and mentor George Mikenberg[1] about the hypothesis you are about to read. George is a particle physicist from CERN, he is a key figure for the ATLAS Experiment and a very patient teacher of physics. As soon as I told him I wanted to write an artistic hypothesis about an imagined fourth fundamental force, he asked “why?”.
I replied because. “Because I want to be able to imagine something new that makes sense in theory and opens up discussions about art and science.” He said, that there is no use in looking, imagining or theorizing about a fourth force, since there is no evidence that it could exist. It is necessary to find and theorize about things that we encounter. For example, we are sure there has to be something else than hadronic matter, so there is a need to look for dark matter. He answered all my questions about the known forces, about matter, about time. He advised me to think about a force, but not a new one, an old one, the original force which combined all of them before they were torn apart during the Big Bang. He found the connection of the hypothesis I was stating to one of the biggest mysteries in science, one that does not even have a theory yet, there is only the idea of its existence: “There was an initial force at the beginning that formed our universe and then disappeared[2],” and it might be the same force I’m proposing.
While talking about the similarities between my imagined fourth force and this original unified force, I told him how artistic and poetic this idea seemed to me. He laughed again. The difference between us is that George, as a physicist, perceives the world in categories: poetry belonging to language, arts belonging to the expression of creativity, physics belonging to knowledge about the universe. I perceive them all as one. I think art does not need evidence of something to create a hypothesis about it. We have the advantage of being in a space where thought counts as evidence. So, here is my hypothesis, accurate, scientifically coherent and happily nonessential.

About my hypothesis, he also said, it is possible, that in unknown conditions, the mass of one proton is different from the mass of another proton. And this is all the evidence and confidence I need to know that my theory is not completely out of orbit.

There is something else which is necessary to announce at this point: Wherever one researches about the fundamental forces, one finds that there are four of them. The discovery that the weak force and the electromagnetic force are one and the same is completely new for me and others, who had learned that these were two different fundamental forces. I think, knowing about the electroweak force was one of my biggest discoveries during the period of time in which I did this research.

“Science is made by men, a self-evident fact that is far too often forgotten. If it is recalled here, it is in hope of reducing the gap between the two cultures, between art and science”[3]

Ruth Ananda Ansehn, World Perspectives

The following research and hypothesis have been done through the lense of artistic knowledge. It is therefore important to point out the way the research was done, the tools available for the study and the significance and role of the artistic lense since it is not usual that an artist pretends to understand science in order to create not only artistic work but also scientific knowledge itself. This being the reason, I will not attempt to call this a scientific project, but rather a speculation on science and particle physics qualified as “poetic but not scientific”[4] in the science world and I am proud of this qualification. It might be seen as an attempt to open a discussion, which will probably only be of interest for non-scientists, about the inner capacity of matter to be reborn.

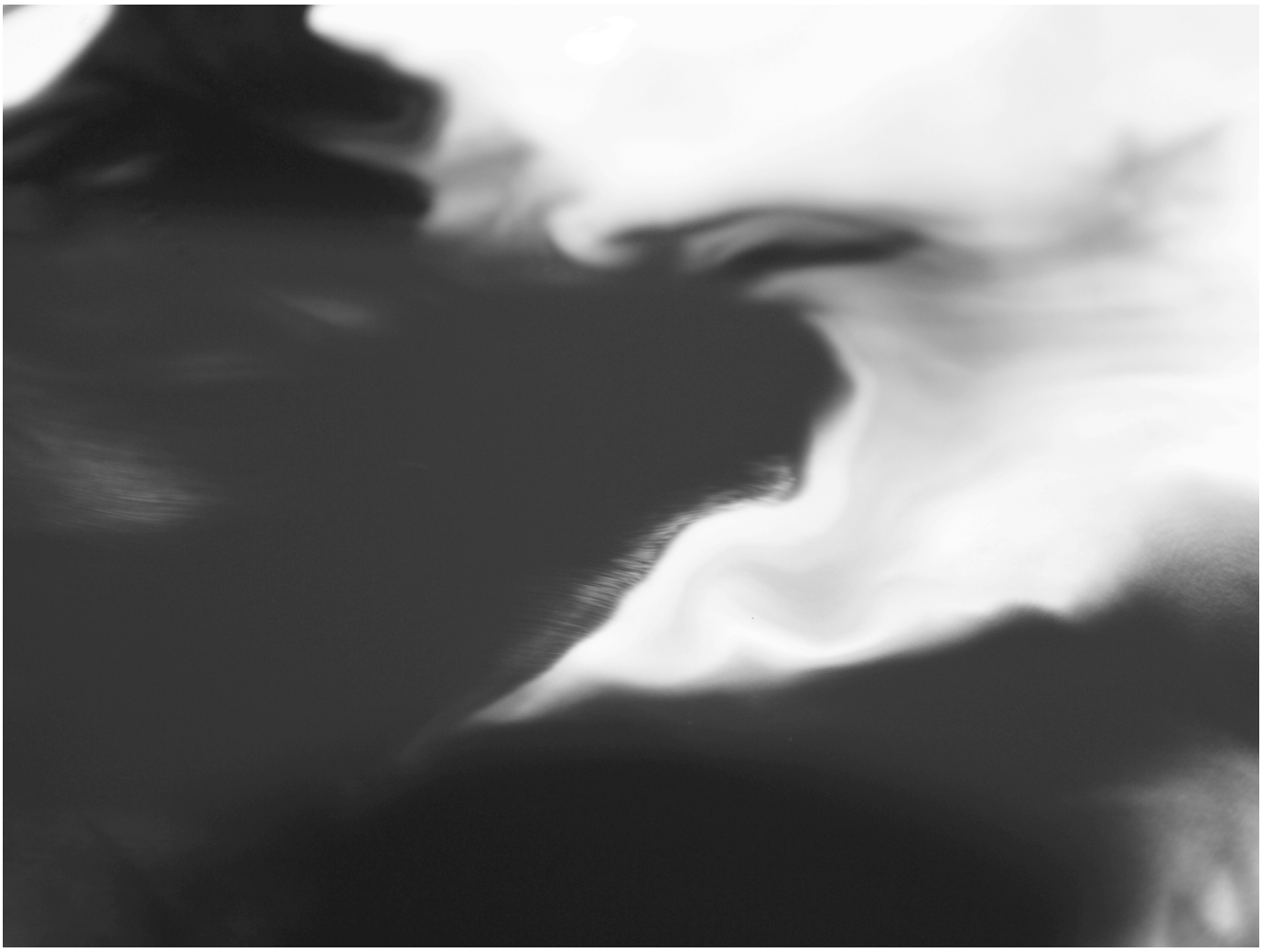
Using the methods available to me (and looking through the lense of a person who has not studied science, but fine arts) I will try to argue my way into my own hypothesis making it as clear and scientifically coherent as possible.

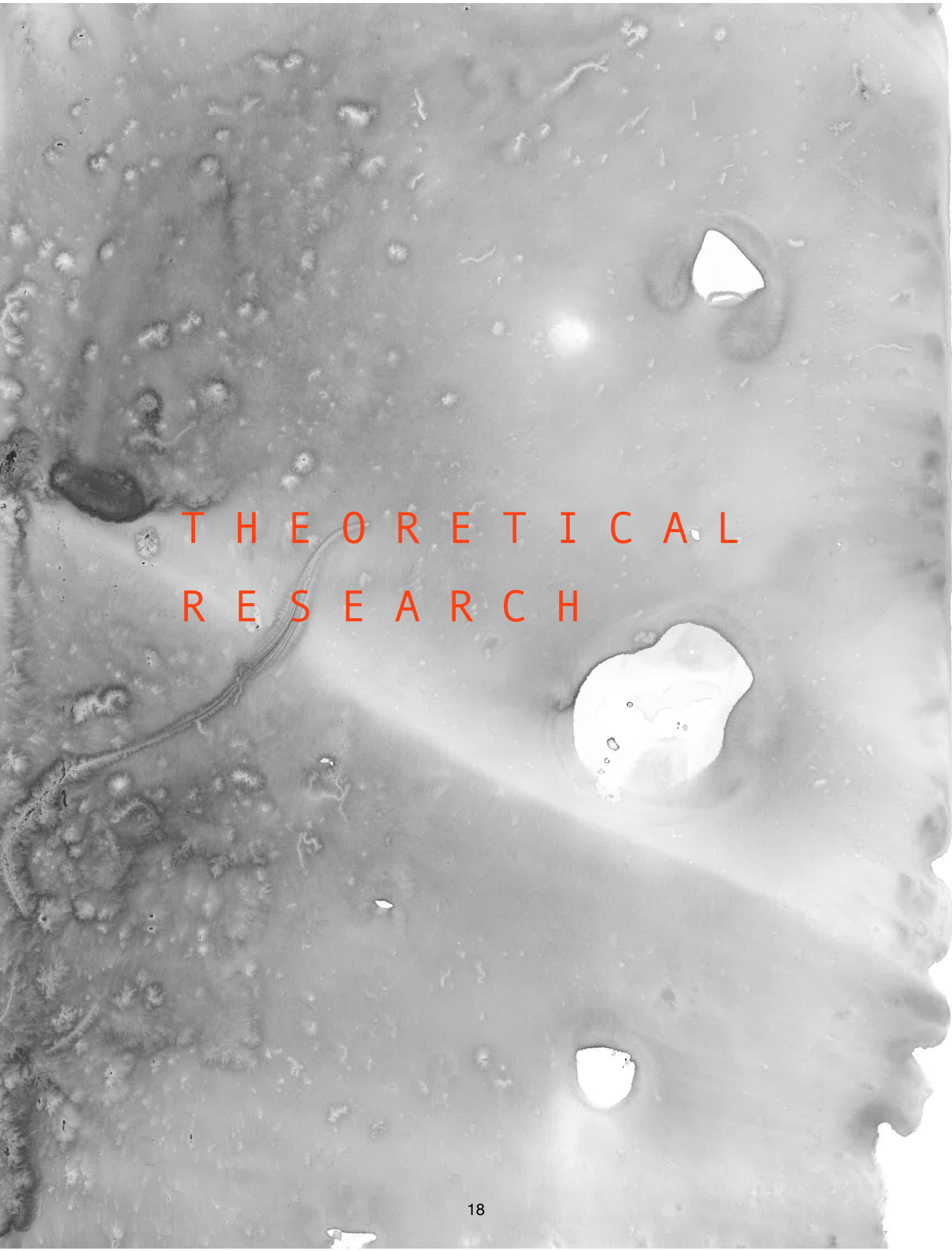
What is the epistemological difference of science, specifically of particle physics for different thought collectives[5]? “Cognition is therefore not an individual process of any theoretical “particular consciousness.” Rather it is the result of a social activity, since the existing stock of knowledge exceeds the range available to any one individual.”[6]

It could also be argued that my hypothesis is, as Ludwick Flek exposes in the second chapter of his book “Genesis and Development of a Scientific Fact”, a Self-fulfilling scientific expectation (Wunschtraumerfüllung)[7], or at least it will try to be. “The liveliest stage of tenacity in systems of opinion is creative fiction, constituting, as it were, the magical realization of ideas and the interpretation that individual expectations in science are actually fulfilled”[8].

“(...) How can we discover the kind of world we presuppose when proceeding as we do? The answer is clear: we cannot discover it from the inside. We need an external standard of criticism, we need a set of alternative assumptions or, as these assumptions will be quite general, constituting, as it were, an entire alternative world, we need a dream-world in order to discover the features of the real world we think we inhabit. (...) We must invent a new conceptual system that suspends, or clashes with, the most carefully established observational results, confounds the most plausible theoretical principles, and introduces perceptions that cannot form part of the existing perceptual world.”[9]

Paul Feyerabend, Against Method





THEORETICAL RESEARCH

M E T H O D S

- Theoretical research in scientific, philosophical and historical texts

- Interviews and collections of thoughts from different scientists

- Basic experimentation with matter

- Contemplation of the scientific world, its way of functioning, its language, form, characteristics etc.

“Any attempt to legitimize a particular approach as the correct one is at best of limited value, since it is intrinsically bound to a thought collective. Neither the style characteristic of opinion nor the technical skills required for any scientific investigation can be formulated in terms of logic. This sort of legitimization is therefore possible only where it is actually no longer required namely among persons whose intellectual constitution is thought-stylized in common and, more particularly, who share approximately the same educational background.”[10]

Background theoretical research

I have based my theoretical research on scientific, philosophical, and historical texts and poetic texts (since I believe poetry has the capacity of being a bridge between art, science and philosophy, meaning it is the perfect LEGO block that fits from one side the scientific world ‹in this case particle physics›, and from the other the artistic world ‹in this case the lens through which I´m observing›).

It is also of basic importance to study the history of certain scientific facts, since it is through history that science takes steps towards new knowledge. For this specific research I concentrated on the history of the atom and the evolution of particle physics, and as those are so inseparable from the development of chemistry, organic chemistry and biology, it makes it vital for me also to study these sciences as well. How has human understanding developed in science, and what parts of this development are crucial for building my hypothesis? The pre-idea of atomic theory stems from Greek antiquity, specifically as taught by Democritus in his original “atomistics.”[11]

An important text to be mentioned here, since I might say it speaks as much of science as of arts (being a scientific/historical text) is Heisenberg’s Physics and Beyond in which one can establish the common characteristics of scientific, artistic, and even musical progress in just the first chapter The Decision to study Physics. After reading this book, I asked myself if it is even possible to talk about art, science, music and mathematics as different paths of humanity or just as branches of the same tree.

“Musicians are entirely in the dark about the next step; as best they grope their way forward. In modern science, the questions are clearly posed, and the task is to find the right answers. In modern art, however, even the questions are uncertain.”[12]

Interviews and collection of thoughts

In the past two years, I have visited several scientific institutions in order to collect as many answers as possible and as many thoughts and opinions as possible about my hypothesis. Two of these institutions are CERN[13] in Geneva, where I interviewed George Mikenberg, an experimental physicist who helped build the ATLAS[14] experiment; and The Cavendish Laboratories in Cambridge, UK, where I had conversations with physicists and physics students, trying to get clear ideas about what is behind scientific facts and the creation of some of the most important (and for my research relevant) theories.

Visiting these institutions gave me the possibility to look into a world that wants to give the impression of being rigid and precise from the outside, but is filled with maybes, perhaps, poetic thinking, and, I dare to say, even beliefs. “I believe space is stable”[15]

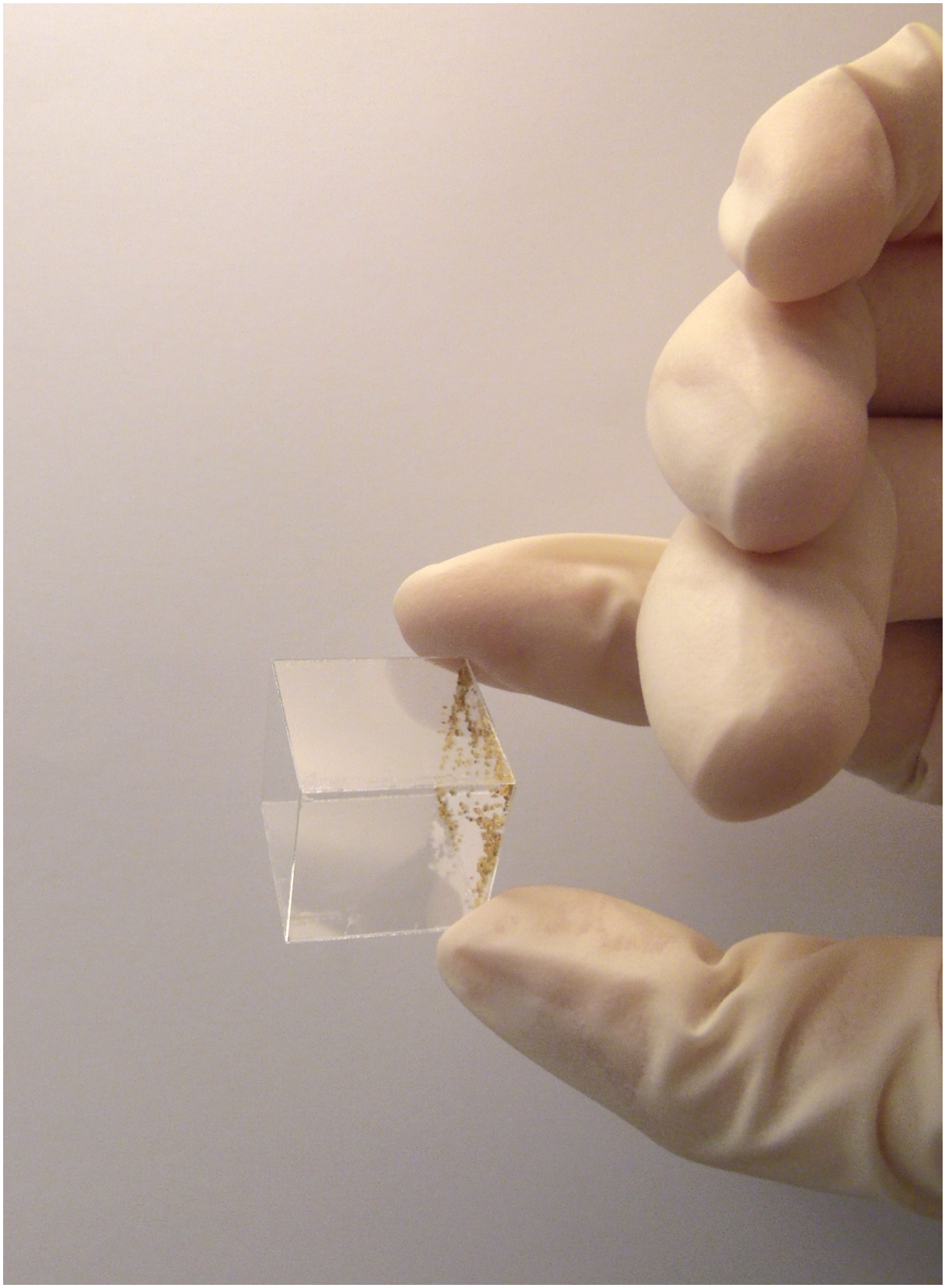
There are two other important facts to be considered while proposing a scientific idea: the place in space and the moment in time. With this I mean my hypothesis was only able to pop up in my head because I am studying the current status of particle physics (moment in time) and it is only relevant thanks to the scientific research in situ of the institutions I visited (place in space). If these two coordinates would not meet right now and here, it would not be a relevant, coherent or even debatable hypothesis (In ancient Mesopotamia it would have been impossible and very irrelevant to talk about atomic reincarnation , for example, since the place and the moment would not have been coherent with the question asked). The insight these visits gave me of the scientific thought was crucial for my task. As follows I will expose an excerpt of my notes done in CERN , although it might be possible that the reason I chose this excerpt might only be understood when reading the second chapter of this text, it is relevant to make the point I'm trying to make about the knowledge gained in Geneva.

CERN, 2016 - personal diary.

“When asked about the origin of the hydrogen used in the LHC experiment[16], George Mikenberg responds: “We order it online”. This is our present. The most important experiment in science orders its prime matter online. The actual origin of the hydrogen is irrelevant for the experiment, it would make no difference for the results if the hydrogen was in the atmosphere, in water, or taken from hydrocarbons, through electrolysis or through thermolysis in a laboratory. - The reason is, -explains Mikenberg-, that according to the theory, every hydrogen atom is exactly the same as every other hydrogen atom in the universe. It is composed of one electron and one proton, the simplest atom in the universe, (although Hydrogen does have an allotrope, diatomic hydrogen), but in this case, a simple hydrogen atom is used- . And the reason to use hydrogen is exactly that, it is the simplest atom and the easiest to tear apart. Since the LHC [16] accelerates and collides only the protons of the atom, they need to separate the proton from the electron before accelerating them. This they do with the help of magnetic forces. The hydrogen (in form of gas) crosses an electric field which separates the protons from the electrons, and conducts only the protons to the first accelerator. Actually, it would make no difference to use protons of any other element, it would just be more difficult to separate them from their electrons. The protons are the same, always, no matter if they were part of a living organism or if they are in helium burning in the sun, protons are (and have always been) the same. As we know, hydrogen was created in the big bang, and makes up a big part of the universe. But essentially, in its core, every proton of every atom is the same proton. Inside of the LHC science is looking for quarks, the sub-particles that build the proton. And these sub-particles, according to science, are the same for every other proton. What makes me wonder is that science has not yet found every little part of the proton. Most of the knowledge we have about the structure and sub particles of the proton is based on theory. And this theory is perfect. It does not show any signs of not being completely accurate. It works every time the LHC finds a new particle, it fits in perfectly. The problem is, they have not found all the sub particles yet. There are still some missing. How can we be completely sure that the theory is correct? When asked about the theory, Mikenberg responded: “If in a hundred years we still have not gathered all the facts to prove this theory, we will build a much bigger machine to prove it, the theory is correct and it will stay the same”. Is this not the same thoughts that science has had from the beginning? The theory is always correct, until it is proven wrong and another correct theory arises.”[17]

E x p e r i m e n t s

With my basic scientific knowledge, I have tried to propose experiments which could help me visualize every step of my hypothesis, similar to the approach I have with scientific texts. I have mixed artistic experience with materials and my expectations of experimenting with matter (matter as particle-physics-matter), and have come up with some ideas that might not be physically possible. I want to be able to show the experiments and their results using artistic materials (since some experiments would take millions of years in real life and some would take millions of Euros, both of which I, unfortunately, don't have). I will call the experiments I was able to run experiments on matter and the ones I will only theoretically propose experiments in theory.



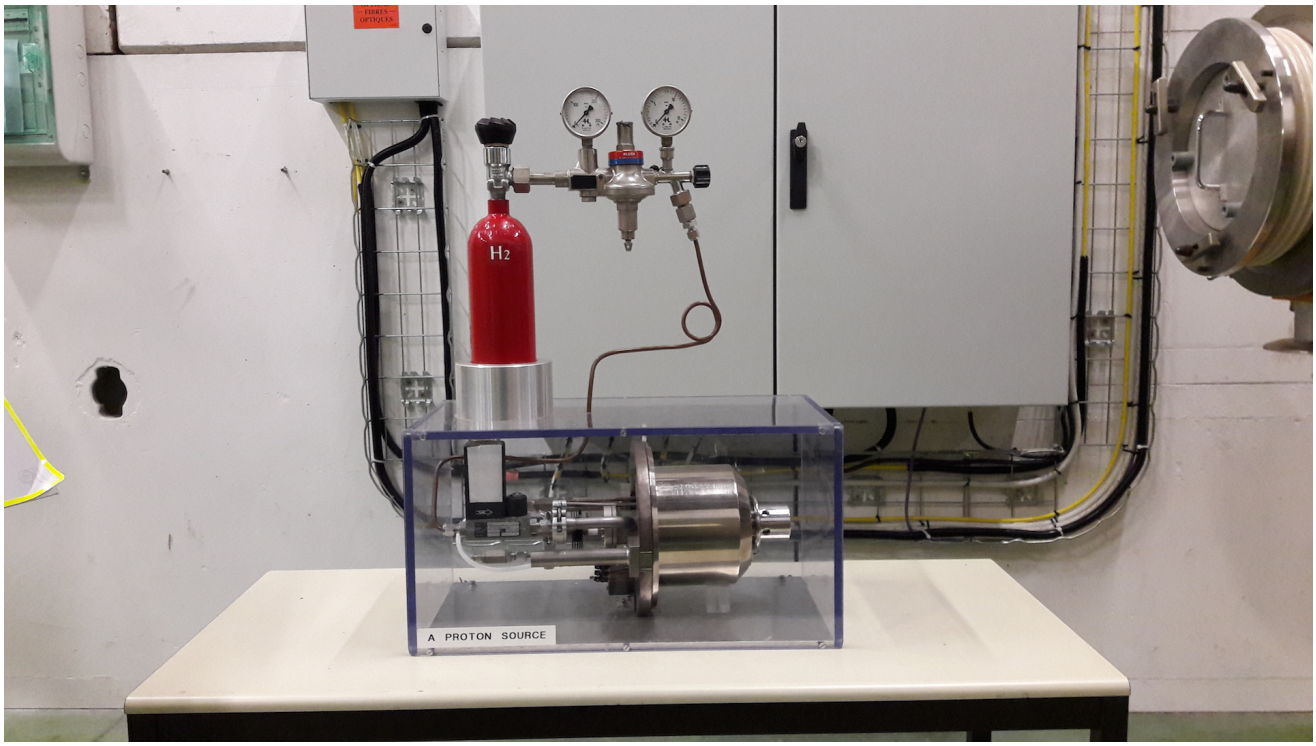
Researching the gravitational force
Picture by Daniela Brill

E x p e r i m e n t i n t h e o r y

“It would be unsound, fancy, and self-contradictory to expect that things which have never yet been done can be done except by means which have never yet been tried” [18]

During my stay at CERN in 2016, I was able to initiate a couple of interviews with scienctists of different branches. I was very interested in the SOURCE, the “proton-generator” for the LHC. In the Source, protons and electrons are divided using electromagnetism. Then, the protons are accelerated into the Large Hadron Collider. My idea here for an experiment in theory was to be able to trace back where the protons came from, by introducing to the Source hydrogen which origin I was already informed of. The reason for not being able to do this experiment is purely logistical, bureaucratic and monetary.

Would there be any difference if I could have introduced hydrogen of living origin ? As I said before, according to George Mikenberg, there would not be any difference, since every proton is exactly the same as any other proton in the world. The only way to make this experiment possible is to imagine the possible differences between protons origintaed in different ways, imagine what would change during the collision and the possible outcome of two protons of one or different origins colliding.



The proton source at Cern
Picture by Daniela Brill

Experiment on matter

Biorock accretion : Mineral accretion technology is a method which uses safe, low voltage electrical currents through seawater, causing dissolved minerals to accrete out on structures, growing into a white limestone similar to that which makes up coral reefs and tropical white sand beaches [19] .

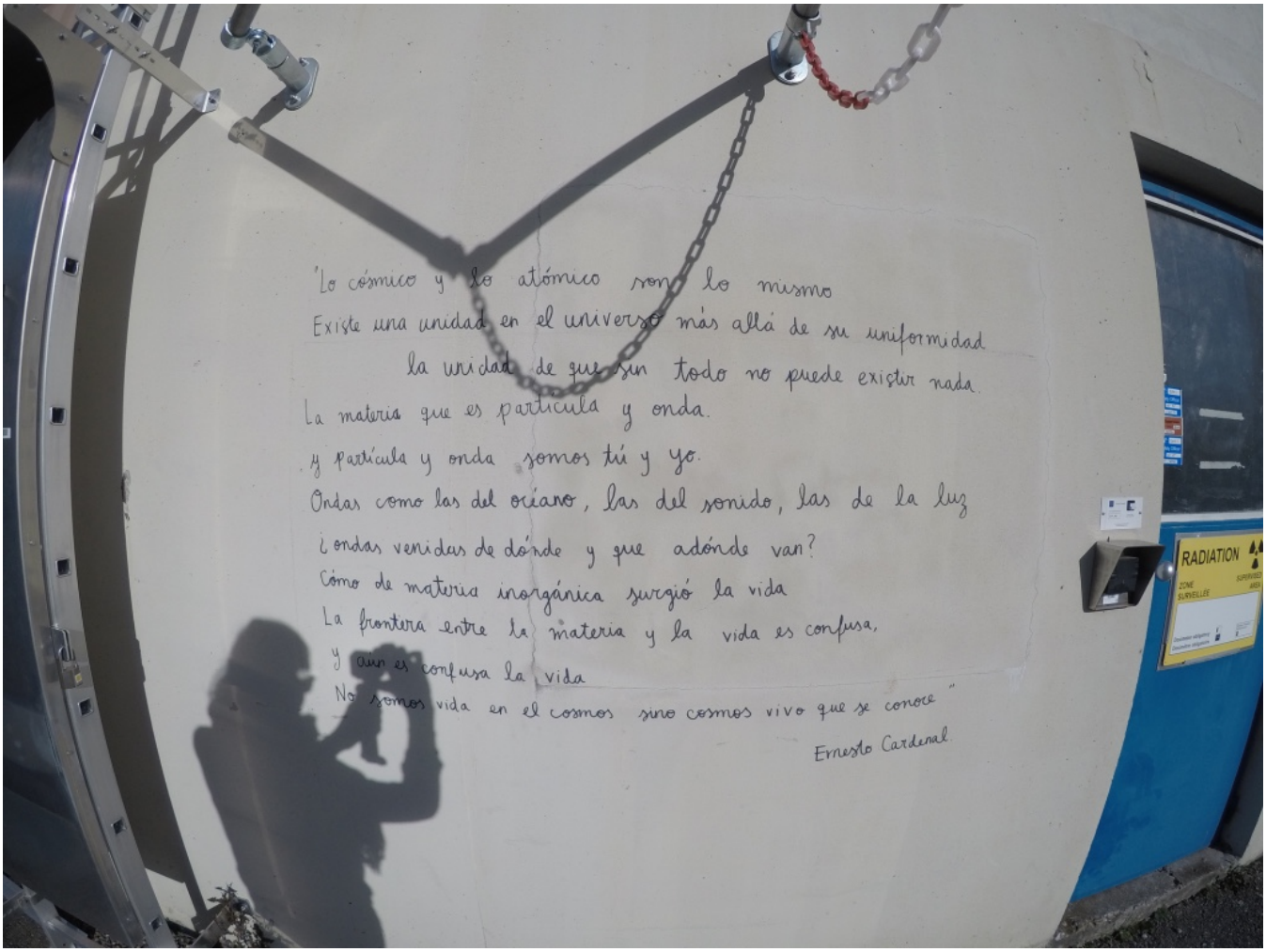
The process of Biorock accretion was invented by Prof. Wolf Hilbertz, and it uses electrolysis to grow mineral stone on a wire mesh. It is therefore relevant for my hypothesis considering the meaningful fact of un-living matter growing . And especially in the case of coral stone, which becomes then a sort of skeleton for animals to grow on. What does it mean that non-living matter behaves like living matter and grows? Is there an intrinsic difference in the atoms, when during the gestation of a human being the bones are being created or the muscles are being created?

The purpose of this experiment was to study the growth of non-living material as a result of basic chemical and electrolytic processes. Since growing is usually attributed to living matter, I propose to speculate about the difference of a carbon atom building the stone and a carbon atom that will later be part of a living organism, for example by entering the cycle of carbon in the atmosphere and becoming respiration for living beings.

"Poiesis", 2016
Picture by Daniela Brill

Contemplation, study and artistic representation of the scientific world and its ideas

I have been gathering not only my own experiences and thoughts in diary-like texts but also the experiences and ideas other artists and poets have had on the scientific world. I watched carefully the words scientists use to refer to particles, machines, and other scientists. The scientific world has opened its doors for artists and I find it interesting to know what new thoughts this implies for both worlds.



Hadronic Lines
Verses of Ernesto Cardenal [24] on the walls of CERN, Geneva, 2018.
Picture by Denise Schellmann

“The cosmic and the atomic are the same.
There exists a unity in the universe beyond its uniformity
    The unity that in everything nothing can exist
Matter that is particle and wave
And particle and wave are you and me
Waves like the oceans´, the sounds´, the lights´
Waves coming from where and directed to where?
How out of inorganic matter life arose
The frontier between matter and life is confusing,
And so is life confusing
We are not life in the cosmos, but living cosmos that know itself” [20]

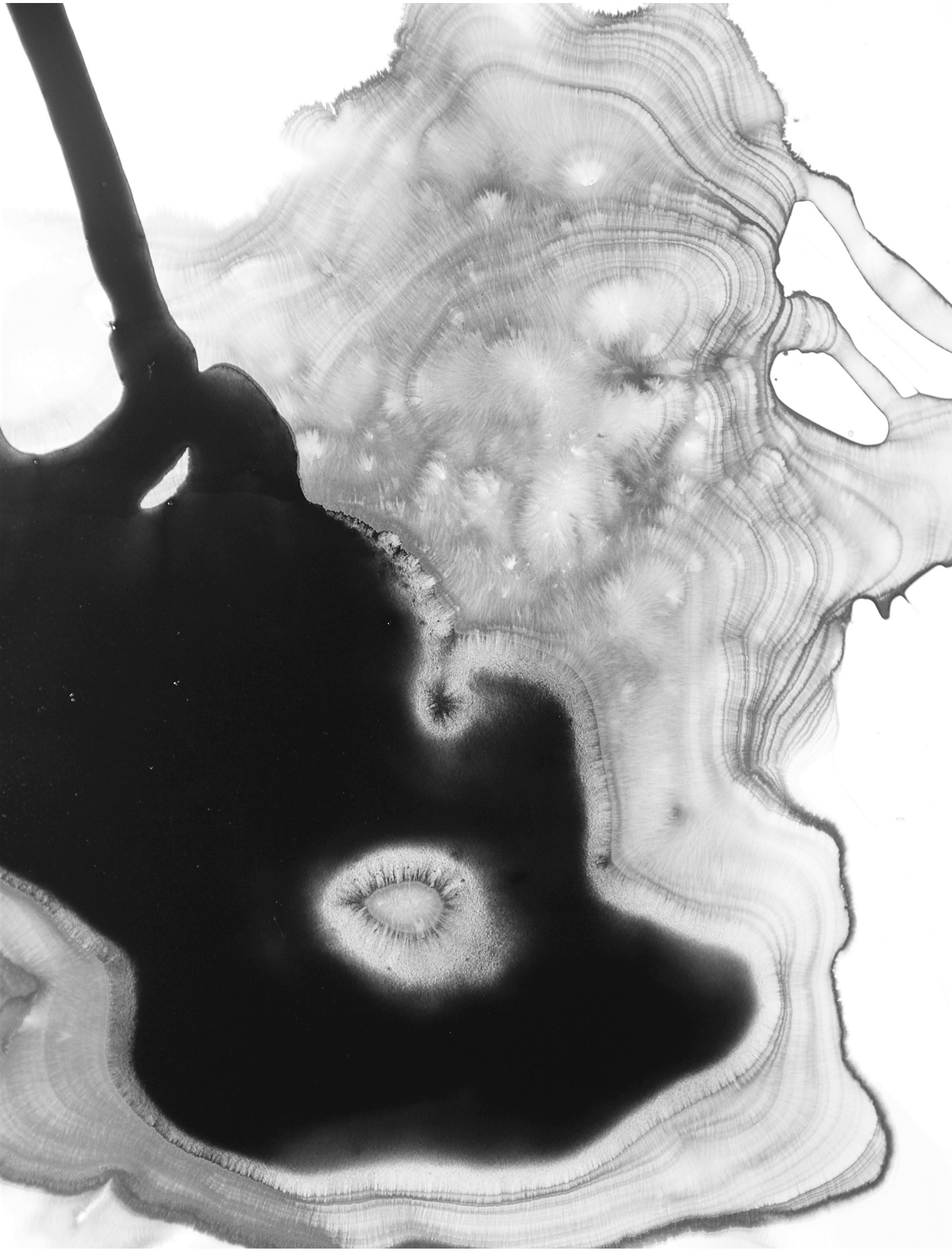
Ernesto Cardenal, Cántico Cósmico

P E R S P E C T I V E

Finally, to close this first chapter, I would like to introduce the meaning and possible influences it has on the hypothesis to be writing it from an artistic perspective. First of all my hypothesis will not be completely scientifically accurate, since it is born out of self-reflection, contemplation and poetic thinking rather than out of expert scientific knowledge. It won't expose all the scientific facts and data there are currently in scientific knowledge about the object of study, basically out of my lack of experience in the field of particle physics and organic chemistry. I have learned, as far as my capabilities go, how the chemical elements in natural sciences function and behave, I have observed and I have asked. My hypothesis is based on intuition rather than facts. The experiments needed to prove it, as well as the knowledge to put the experiments into action, are more mythical than scientifical. “Myth differs from science (...) only in style. Science seeks to include in its system a maximum of those passive elements irrespective of inherent lucidity. Myth contains only a few such passive elements, but they are artistically composed.”[21]

And since the experiments are assumptions of the behavior of matter, and my personal field of knowledge is fine arts, I will make use of it to stage them. It is, nevertheless, impossible to prove the hypothesis of a fourth fundamental force in nature . In my personal artistic way of working, matter is usually part of the final product of the work and research. The idea appears, the concept is developed by collecting materials and working with their own materiality. The final work is presented out of these steps. In this case, matter is the element of study, the object to be discovered by studying its fundamental forces, its inner particles and its inherent qualities. The final work is not only the artistic representation or presentation of matter but also, and most importantly, the scientific approach, research, and hypothesis born out of the study. The hypothesis is, in itself, the work of art. And the artistic piece is only the visualization of it, the hand made pillars holding the unprovable hypothesis in the space.

I do have to add to this, the possibility of having a positive influence on the hypothesis that it does not have its roots in the scientific realms, but in the artistic ones. Since many theories in science (and in life) are born out of curiosity, and it is the fact that the non-scientist, the outsider[22] is not immersed in the scientific world that makes him able to see things from other perspectives. Not knowing the rules makes it easier to break them, even on a hypothetical level. Not knowing or understanding what the theory means makes it easier to forget about the theory or the mathematics and just jump straight to the question, without being held back by numbers that don’t match or possibilities that don’t make any “sense”.



“People starting from different social backgrounds will approach the world in different ways and learn different things about it. People survived millennia before Western science arose; to do this they had to know their surroundings up to including elements of astronomy.”[23]

Paul Feyerabend, Against Method

A WILD SPECULATION

´Atomycism´: Term used by Werner Heisenberg quoting Wolfgang Pauli in one of his conversations: “Sommerfeld hopes that experiments will help us to find some of the new laws. He believes in numerical links, almost in a kind of number mysticism of the kind the Pythagoreans applied to the harmony of vibrating strings. That’s why many of us have called this side of science `atomycism,´ (...) Perhaps it’s much easier to find one’s way if one isn’t too familiar with the magnificent unity of classical physics.”[24]

I would dare to state that almost every hypothesis seemed to be, at some point, just a wild speculation[25] , to use Heisenberg’s words[26] in his book Physics and Beyond, referring to Plato's’ Timaeus, where he proposes his idea of matter being composed of right-angled squares and triangles, which combined create the regular bodies of solid geometry: cubes, tetrahedrons, octahedrons, and icosahedrons[27] , being these geometrical figures the building blocks of the four elements, earth, fire, air and water.[28] And this specific wild speculation is relevant for my hypothesis since it is one of the several try-outs that humans had about the form and function of the smallest building blocks of matter. Before Plato, there were other ideas, but this one is special for me, not only because it imagines a world where the basic particles of matter are “easy” to understand, but also because they have a familiar, geometrical form; basic information that could be the explanation for something much more complicated. Basic geometrical forms representing basic matter, geometry organizing itself to create water, earth, air or fire. After stating that Plato's’ idea was a wild speculation, Heisenberg refers to the elusive characteristic of atoms to be represented in any graphic way, since they are not part of our obvious part of the objective world[29], and the better possibility of understanding them through mathematics. It is mathematics which can provide an understanding about the laws of nature in its smallest parts, the parts that are invisible to the eye, the ones which characteristics we can only deduce out of their behavior, out of their effects. As explained in Chapter 1, I will not attempt to find a mathematical form to prove my thoughts correct, I will rather do it narratively and figuratively, as it is closer to me and to my background.

I will try, in the following text, to give the reasons I think that matter, in its atomic form, is intrinsically driven by a force to build the molecules it forms, the Force of Embodiment, or F.E. This force could also be compatible with the unified force all the known forces were before the separation of them after the big bang. It tracks the atomic forces back to their origin when they were only one force.
There is no current theory in physics that unifies the known forces into one only force. George Mikenberg, my collaboration partner and physicist at CERN, says that it is very possible there was one original initial force at the beginning, that later disappeared by breaking into the fundamental forces we know. If this separation had gone one millimeter different than it did we would not exist, or better, reality as we know it would not exist, this is called fine-tuning. Everything, to the last millimeter, is perfectly tuned to work as it does. Maybe there are different universes, George says, different dimensions that resulted out of this break of the original force.

A FOURTH FUNDAMENTAL FORCE

Thomas Theorem: A concept formulated by the American sociologist William Isaac Thomas (1863–1967) ‘“Facts” do not have a uniform existence apart from the persons who observe and interpret them. Rather, the “real” facts are the ways in which different people come into and define situations’.[30]

There are three fundamental forces in nature according to physics: the gravitational force, the electromagnetic force or the weak force (which until recently where defined as separate forces, but were discovered to be the same force) and the strong force. These forces apply to everything in the universe, the weakest one being the gravitational force, which is the only one we can easily perceive with our human bodies. The other three apply mostly on atomic scales, being responsible for the behavior of the sub-particles. For example, the strong force keeps the to protons, positively charged, from repelling each other, keeping them together in the nucleus. The weak force, or electromagnetic force, causes radioactive decay (which will be of importance later on for this hypothesis) and is responsible for every interaction between the charged particles inside and outside of atoms (every charged particle interacts with other charged particles due to electromagnetism).

Recently, there has been a lot of different theories put forth about a fourth force. The research on this has increased since new discoveries have been made in astronomy (such as the existence of dark matter and dark energy) that could be not only a different particle, but also a fundamental force. The difficult part of proving the fourth force is mostly that the required equipment would have to be very sensitive and be able to measure very weak interactions. Anything weaker than the gravitational force, which is the weakest one, and one can only be measured with objects larger than the size of the earth, is really difficult to prove. And, as stated before, if there is no scientific need for a new discovery it doesn’t make sense to look for it.

If there is no need for a fourth force, there is no need to look for it.

I refer to “ atomic reincarnation ” not with the hope of turning this hypothesis into a belief, even though I’m aware of the religious weight the word “reincarnation” carries. I do find a bridge to Buddhism with the idea of matter being nothing but energy, and constantly going through change. I use the term “ reincarnation ” more like the act of being part of one body, and then, becoming part of a new body, the “embodiment in a new form”. Another bridge I would like to point out, is determinism, since this force that I’m proposing is, somehow, deterministic. This means this force is the one determining what will be the effect that the cause will have. In Buddhism, this is called the law of “cause and effect,” or Karma[31] .

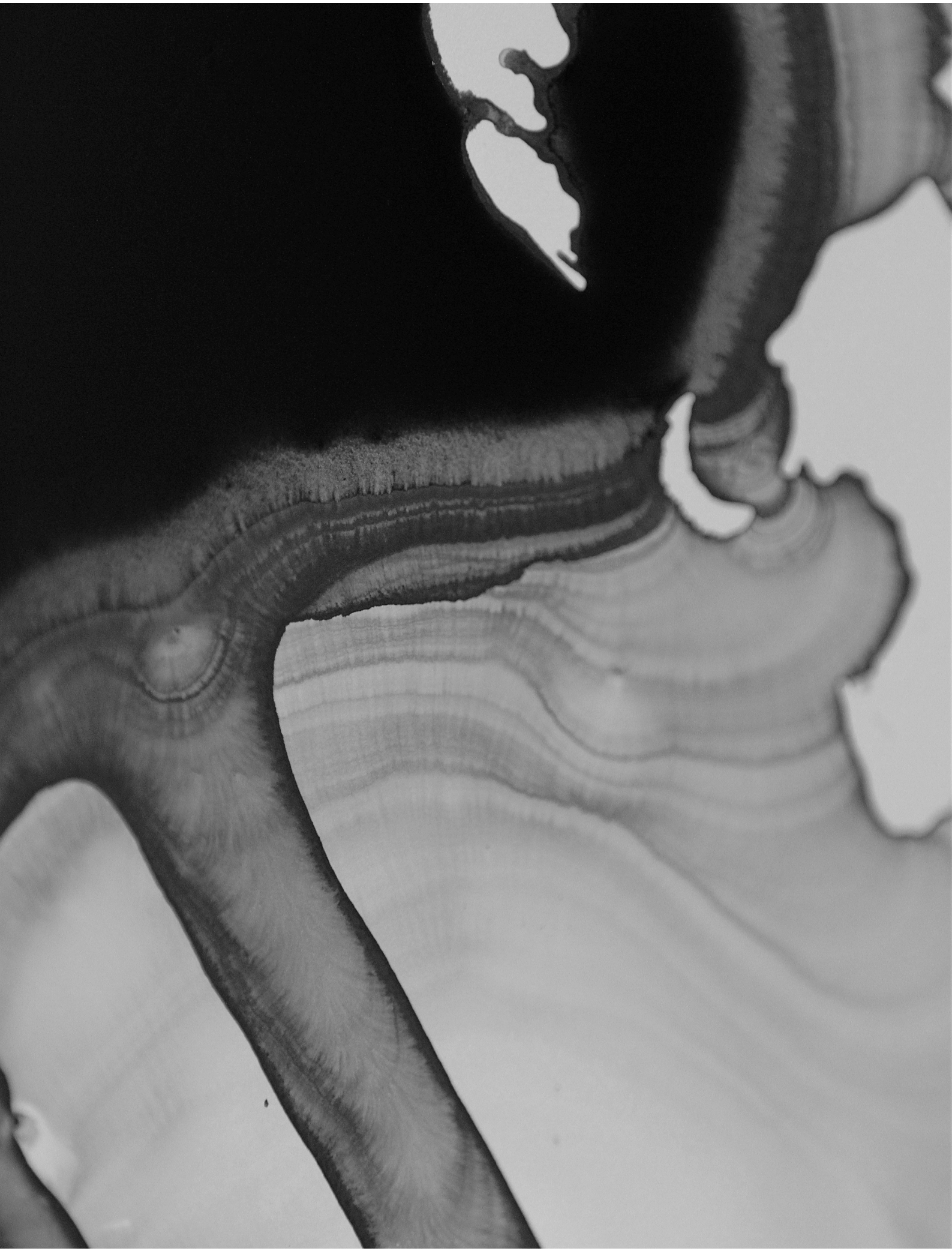
I have called the fourth force “Force of Embodiment”, or F.E, due to its steering purpose, meaning that its task is to steer the atom, molecule or system to the new body it will bind or create. The letters F.E have another meaning: in Spanish, my mother tongue, fé means faith, or belief. And, as I have stated in the first chapter, this hypothesis is mostly based on that, a hunch[32] that the force exists. FE also implies that the systems could be conscious, and have their own will or purpose.

Having referred to everything that could imply religious, esoteric or non-scientific thoughts I would like to state that this is not the main point of this hypothesis, nor the main point of departure.

“Most people take the word "reincarnation" to imply there is some "thing" that reincarnates, which travels from life to life. But in Buddhism we do not believe in an independent and unchanging entity like a soul or ego that survives the death of the body. What provides the continuity between lives is not an entity, we believe, but the ultimately subtlest level of consciousness.”[33] In this case, the consciousness Sogyal Rinpoche is referring to could be, on an atomic level, the Force of Embodiment.

Max Tegmark, theoretical physicist at MIT, proposed consciousness as a new state of matter . “I look at you, I see all my friends here, but I also see a vast number of quarks and electrons; And if I only looked at these quarks and electrons, how could I just by looking at that picture figure out how out of these perceived group of objects (...) which of these objects are conscious (...)”[34] Some years ago, a statement like Tegmark’s would have been completely put aside by classical physics, but he has the theoretical background and the correct hypothesis to formulate that this might actually be the case in quantum mechanics. He proposes that there are many states of consciousness, just like in matter there are different states, like liquid, solid or gas. While at CERN, I heard the phrase “this particle decided to give up its life for this picture” while listening to a lecture by theoretical physicist John Ellis. He was referring to the decision that a particle took to collide with another particle and create the collision picture that we were looking at. And this statement made me think about all the different words that scientists use to describe atomic or protonic behavior as if protons had the capacity to make decisions, as if they were conscious. Maybe consciousness is a state of matter, and maybe it is intrinsic to matter to make decisions . Max Tegmark works together with neuroscientist Giulio Tononi, who proposes two specific traits consciousness must have. First, it must be able to store information and second, this information has to gather into a unified cluster that cannot be separated into smaller parts. This allows scientists and mathematicians to study it since these traits can be treated mathematically. A system that is conscious must be able to gather information, store it and give it back correctly. For this, the system must be able to process data.

He introduces the term perceptronium, a substance that is self-aware. The conscious state of matter. Tegmark's idea differs from my hypothesis in the way that he proposes a state of matter, while I'm proposing a force. Forces only exist when there is an interaction between two or more subjects. A force drives the protons to interact in the nucleus, a force keeps the moon orbiting around the earth and the earth around the sun. A state of matter refers to the density of the particles, and the possibility that exists to go from one state into the other by adding energy.



THE FORCE OF EMBODIMENT

Everyday ideas cannot be applied to physics on very large and very small scales without introducing what appear to be paradoxes and irrelevancies.[35]

Gordon Fraser, The Particle Century

I propose a fourth fundamental force. One that works inside of the atoms. I call it the Force of Embodiment.

A fourth force has been proposed many times in particle physics and astrophysics. Actually, until recently it was the fifth force, since it was believed was the electromagnetic force and the weak force were different, but now, it has been discovered that they are the same force. Due to discoveries made in cosmology that don't match any of the current theories, for example the existence of dark matter, which makes up to 95% of the universe, and the possibility of dark energy to be responsible for the ongoing expansion of the universe, there have been hypothesis that state that dark matter and dark energy (the quintessence) are not undiscovered particles, but fundamental forces.

However, the force I'm proposing is not about the mass of the universe (dark matter) or the expansion of the universe (dark energy), but about Atomic Reincarnation, or how it is intrinsic to matter to change from one body to another. This force interacts with the other three forces. For example, it is the electromagnetic force that causes electrons to interact with other atoms binding molecules. And my statement is, that the F.E is responsible for the type of molecule this atom will bind into. It also interacts with the weak force, since this one is in control of the loss of electrons from atomic decay, and the decay of one atom, for example, of carbon, is just one step on the cycle of atomic reincarnation. How the atom behaves during the decay is the duty of the weak force, but the molecules it will bind into by becoming radioactive is the duty of the F.E.

The beauty of it relies on the fact that there is a phenomenon, that looks somehow really complicated and very difficult to grasp; And then you find easy reasons why things are the way they are out of these discoveries you make. And maybe you can even associate things to other things that seemed to be completely independent at the beginning. I think, one of my deep motivations is to find connections or explanations that relate. And there is nothing I enjoy more than to discover a connection between two things, that one could not have suspected before. (CERN theory-group, The theoretic: John Ellis)[36]

The electron was discovered in 1897. This discovery brought within itself a huge amount of new information about the universe; about the microscopic and the macroscopic understanding of it, it showed physicists how finely sophisticated and filigram matter is. After this, quantum mechanics had a major jump into new ways of speculating and theorizing about the building blocks of matter. The next century, which in many texts is referred to as the “particle century” brought along many discoveries, developments and thoughts about the origin of matter, life, the universe etc.

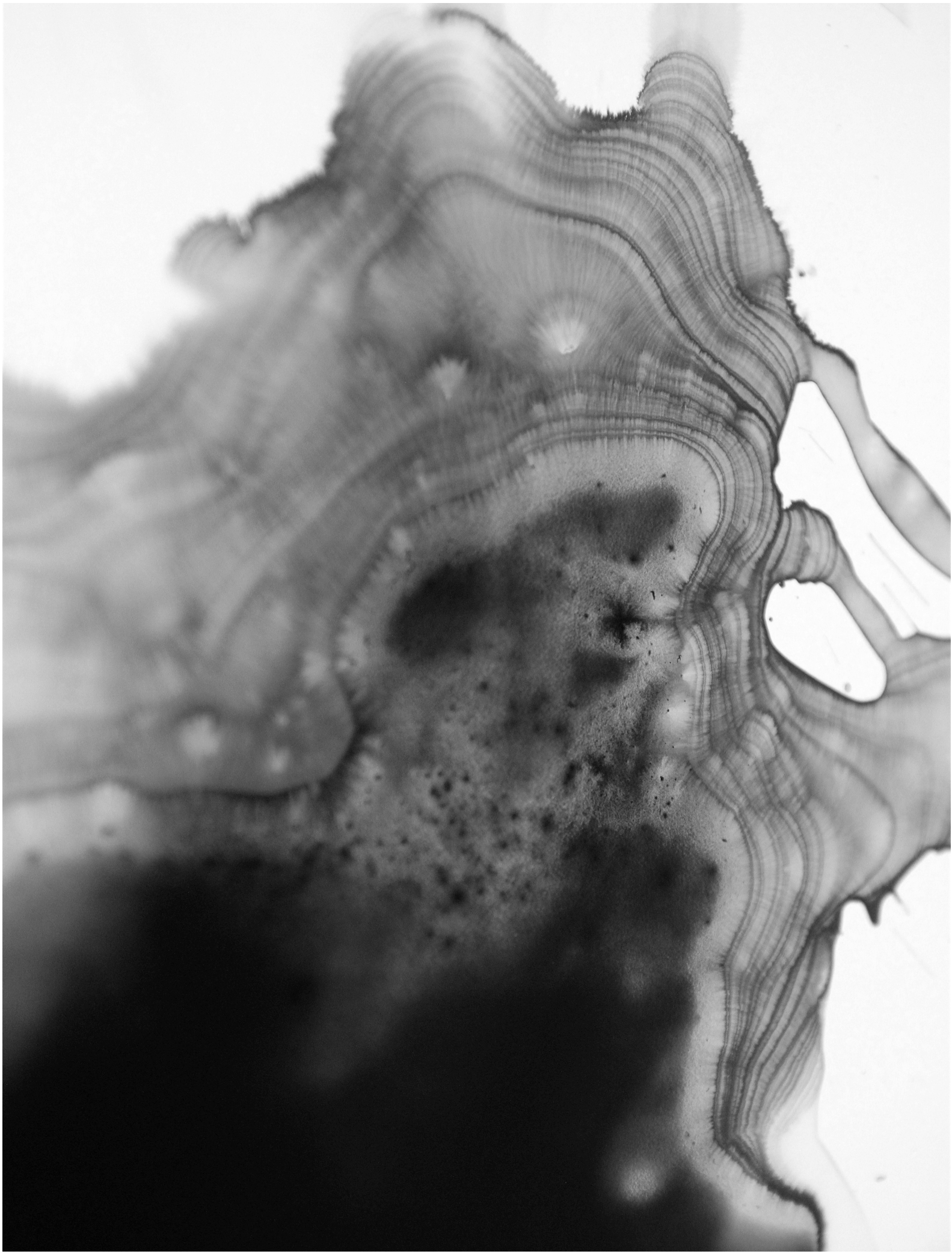
My hypothesis might follow the Heraclitean thought of constant change, since it states that matter is always changing, jumping from one body to another. Change is, in this case, intrinsic to it. It is inside of matter that the transformations take place but matter itself in its basic form does not change. Imagine an atom, in which the center of it, the nucleus, is the control room. Every control room is exactly the same as the other control room, but every programme being played in every control room is different. The hydrogen atom consists of one proton, one electron, and one neutron. All of them are physically equal, as my friend George Mikenberg taught me, all nuclei contain protons, all protons in the entire universe behave the same, have the same number of quarks according to the latest discoveries in particle physics, and therefore, all matter is composed exactly of the same building blocks, 12 fundamental fermions, and 5 fundamental bosons, it’s as simple as that.

“No one has the answer for the origin. (laughs) The hydrogen atoms we use here in CERN for our experiments are the same as every other hydrogen atoms. We know all protons are the same because they are made out of the same quarks. And they all behave the same way, they have the same quantum elements, mass, spin (which is the number of possibilities to go around themselves) and electric charge. It is possible to calculate which quarks there are. And all of them have been proven according to their characteristics. The problem is, that these particles don’t have any dimensions, that’s what makes them special. It can be proven with collision experiments, like with billiard balls, that they deviate on their trace. This means they exist, but they don’t have dimensions. Or they have dimensions that are impossible for us to prove, at least 10 to the minus 19th of a meter”.[37]

Nevertheless, as equal as each proton is to every other proton in the universe, there are protons forming living matter and there are protons forming nonliving matter.

The organization of the sub-particles into particles (neutron, proton, electron) must, following these thoughts, always occur the same way. The change is in the organization of atoms, the number of electrons and protons that decide to unify and the reason they do so. After this step, in which an atom of carbon, for example, is created, the development of the organization depends on the element that is being created. This is an important step for the organization of particles into atoms, which takes place naturally following the conditions surrounding the atom and which follows the electromagnetic force inside and outside of it.

It is here, where I believe the atom has an intrinsic self-organizing mechanism that pushes it to build the molecule which it will be part of. This force , drive , or even atomic entelechy[38] , is already inside of the atom, and not outside. It is not only an outside factor that is driving the atom to organize itself a certain way, it is a chemical process that takes places in an environment, which has to be ideal for it to happen, but it is also an inside factor, common to each atom, element, and particle that, depending on the stage in which it finds itself will drive it to build all the different molecules.



“Each of the elements, he (Aristotle) argued, is a composed of form and matter; since the matter in question is capable of assuming a succession of forms, the elements can be transformed into one another. The forms instrumental in producing the elements are those associated with the four primary or “elemental” qualities: hot, cold, wet, and dry. (...) But this primary matter has the capacity to receive any of the four elemental qualities. Therefore, if the quality of dryness in a piece of the element earth yields to wetness through the action of a suitable agent, that piece of earth will cease to exist, and an appropriate amount of the element water will take its place. Aristotle argued that such transformations occur constantly, and the elements are constantly being transmuted one into another.”[39]

Lindberg, D. C. (2008). The beginnings of Western Science

HADRONIC MATTER AND ITS CYCLE

HYDROGEN

“Tatsächlich ist alles, was wir in diesem Buch bisher erörtert haben, und ebenso alles, was wir bis zur letzten Seite noch erörtern werden, im Grunde nichts anderes als die Geschichte der Veränderungen und Wandlungen, die der Wasserstoff unter der Einwirkungen der Naturgesetze durchzumachen begann, nachdem der Big Bang ihn in dieses Universum befördert hatte.”[40]

Ordinary matter, like the one building our human bodies, is hadronic matter. Hadrons are subatomic particles acting according to the strong force. Protons and neutrons, as stated before, are kept together in the nucleus thanks to the strong force, which, even though they have the same charge and should repel each other, keeps them “glued” together. The particles that carry the strong force are called gluons. The nucleus of the atom and therefore the hadronic particles make up a great amount of our mass since the electrons (particles outside of the nucleus) don’t contribute for more than 1/1800 of the total mass. In cosmology hadronic matter is everything that is not dark matter. And, as it is known, dark matter is one of the biggest mysteries in science.

All the matter known to man is hadronic matter. An atom of hydrogen created at the Big Bang is hadronic matter. It has traveled since the beginning of time transforming and changing, building all molecules and all elements known to exist. The sub-particles inside of the atom behaved following forces, looking for equilibrium, transmuting into different states according to the inner and the outer forces and energies. At the beginning, before this hydrogen atom was created, all forces were combined in one single original force. Hydrogen is, for my hypothesis, a kind of case zero . This means, this intrinsic force I’m proposing has to have existed already in the first hydrogen atom, since I believe it is hereditary, and it is transferred from one atom to the other, similarly as genetic material being transferred during mitosis.

C A R B O N

Most of the carbon in the universe is created when low mass stars die, although there is also carbon being created when massive stars explode. Every element in the periodic table is created either when a star explodes or when it merges with other stars. The only exception are the elements created by cosmic ray fission or directly out of the big bang, like in the case of hydrogen.

Every carbon atom in the universe is exactly equal to every other carbon atom. And carbon is an essential part of the earth, its cycles, the atmosphere, and the living and non-living matter that inhabits it. My hypothesis states that carbon atoms, being the element that binds life through compound molecules, have an intrinsic force that drives them differently when building up the calcium carbonate of the shells or when building up the DNA of the snail inside the shell. Carbon is the only element that has the ability to bind compound organic molecules, thereby creating “living matter”. Although science is trying to find the way to bind life out of silicon atoms (silicon-based life), on earth, there is only carbon-based life.

Carbon decays in different isotopes, including Radiocarbon, or C14, which is radioactive carbon found on archeological pieces and useful in finding out how old organic matter is. This carbon is the same that kept the organism alive, is is the same one that bounded the compound molecules into living matter. And after millions of years, it starts decaying, and becoming radioactive, changing into a different state. As I said before, this decay takes places due to the weak force.

Going back to the idea of wild speculation, I would like to state that these carbon atoms are not only driven by outside forces in order to create compound molecules and afterwards decay, become radiocarbon, become mineral carbon and then start the cycle all over again. I think they bear the Force of Embodiment, keeping the quarks and leptons functioning as basic building blocks of matter. It is not only the environment which shapes living matter but the F.E that steers it into the direction of the form it will take.

The cycle of carbon during the creation of solar energy is a good example to explain the states of matter it embodies possibly through the Force of Embodiment working together with the electromagnetic/weak force and the environment in which the reaction is taking place:

“Starting, for instance, with ordinary carbon (C12), we see that the result of a collision with a proton is the formation of the lighter isotope of nitrogen (N13), and the liberation of some sub-atomic energy in form of γ -ray. (...) The nucleus of nitrogen, being unstable, adjusts itself by emitting a positive electron, or positive β- particle, and becoming the stable nucleus of the heavier carbon isotope (C13), which is known to be present in small quantities in ordinary coal. Being struck by another thermal proton, this carbon isotope is transformed into ordinary nitrogen (N14), with additional intense gamma radiation. Now the nucleus of N14 (from which we could have easily have begun our description of the cycle) collides with stil another (third) thermal proton and gives rise to an unstable oxygen isotope (O15), which very rapidly goes over to the stable N15 through the emission of a positive electron. (...) Thus, we see that the nuclei of carbon and nitrogen in our circular reaction chain are forever being regenerated, and act only as catalysts (...) We may therefore describe the whole process as the transformation of hydrogen into helium as induced by high temperatures and aided by the catalytic action of carbon and nitrogen.” [41]

In this cycle, the F.E acts on the original carbon atom at the moment it collides with the proton and forms the isotope N13. The same happens throughout the reaction with a

different amount of force since this depends on the reaction and the environment itself. The force is always steering the reaction until it completes the cycle and then it waits for the atom to transform into the next molecule or body , or the molecular density into the next state of matter.

STUART KAUFFMAN'S THEORY OF SELF ORGANIZATION AS A REASON FOR LIFE AND STATISTICS AS A REASON FOR MATTER STRUCTURES SUCH AS MOLECULES AND THE FORCE OF EMBODIMENT

"Biologists have, as yet, no conceptual framework in which to study an evolutionary process that commingles both self-organization and selection. How does selection work on systems that already generate spontaneous order? Physics has its profound spontaneous order, but no need of selection. Biologists, subliminally aware of such spontaneous order, have nevertheless ignored it and focused almost entirely on selection. (...) Life and its evolution have always depended on the mutual embrace of spontaneous order and selection´s crafting that order. We need to paint a new picture"[42]

Outside of the atoms, there are many factors that could be responsible for the atomic binding-behavior. I particularly find Stuarts Kauffmann's theory interesting and important for my hypothesis, since it states that the process is merely statistical. This could actually imply that, statistically life-binding atoms react because of mathematics to create life, following the intrinsic force I'm referring to. Kauffmann proposes the possibility of life being a natural result of chemistry through the study of self-sustaining chemical reactions, in which the catalytic systems, and its quality of being opened, act as the reasons for it to be alive. This speculation reminds me of the theories of spontaneous generation , although Kauffmann's theory is much more statistical and theoretically coherent as Van Helmont's Ortus Medicinae an experiment to create new mice with a "recipe" of putting together elements such as sweat, wheat, and darkness and waiting for some days until the new mice arise out of these. Louise Pasteur proved this theory to be wrong almost 200 years later, proving that life emerged inside a test tube only because there were microscopic Animalcula floating in the air around it causing bacteria to grow in the tube, and in doing so, also proving that the mice Van Helmont was "creating" were not actually born inside of the experiment, but came from the outside, just like the bacteria in Pasteur's experiment. But Kauffmann's theory is nothing like Van Helmont's theory. Kauffmann relies on mathematics, statistics, chemical properties of molecules and behavior of matter to prove his point. "I hope to persuade you that life is a natural property of complex chemical systems, that when the number of different kinds of molecules in a chemical soup passes a certain threshold, a self-sustaining network of reactions - an autocatalytic metabolism - will suddenly appear"[43] .

I will try to point out the possibility of Kauffmann's theory of being a step for understanding my own theory about atomic reincarnation and a proof of the existence of a fourth fundamental force. With this goal, I would like to concentrate first on the meaning of the terms he uses in his discourse since they are of significance to my research.

Catalysis and auto-catalytic systems:

This term is used when in a chemical reaction an acceleration takes place by introducing a substance that is not consumed during the reaction[44], thereby helping the reacting elements reach equilibrium faster. In biology a good example of a catalyst (the added substance) are enzymes. Catalysts are regenerated, and they do not affect the equilibrium of the reaction itself, only the rate at which the equilibrium is reached. There are cases in which the catalyst is also a reacting element, or when a product of the reaction also acts as a catalyst, in this case, the system is auto-catalytic.

Closed and opened thermodynamic systems:

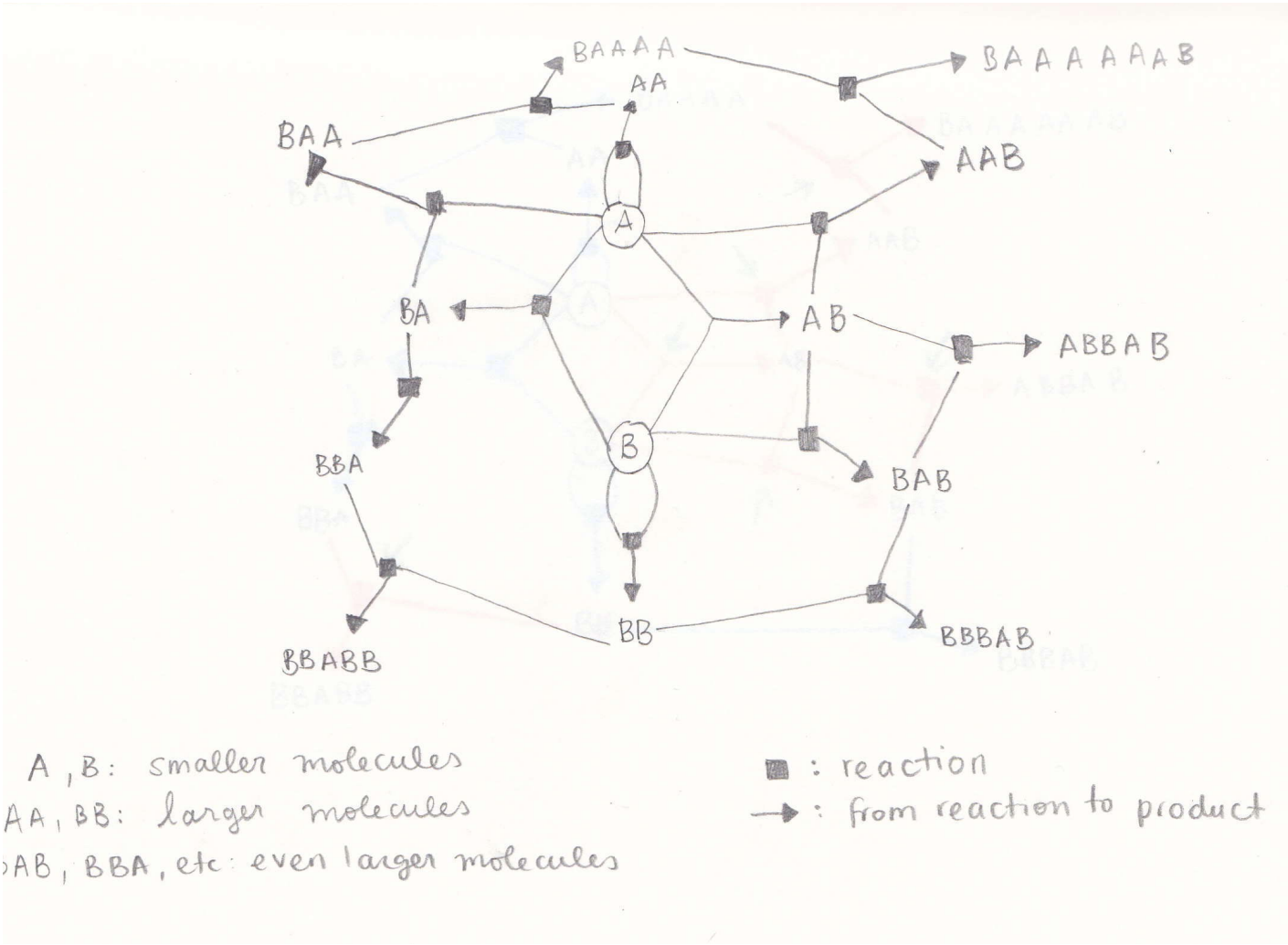
All chemical elements are created in space. The chemical reactions that take place so that molecules can rearrange and create different atoms and molecules are part of open thermodynamic systems. Here, a thermodynamic system reacts freely allowing energy and matter to flow from the outside in and from the inside out. It needs the input from the outside to function, they are driven by non-equilibrium processes . Every reaction is constantly trying to reach equilibrium, this means, trying to reach molecular balance. Of course, a system that reaches equilibrium needs no longer to react. For a living system this would mean it is no longer alive. Every living cell is an open thermodynamic system, driven by non-equilibrium. In a closed thermodynamic system the molecules react exchanging energy with the surroundings but not exchanging matter. “We should be thankful that our cells are not at chemical equilibrium; for a living system, equilibrium corresponds to death. Living systems are, instead, open thermodynamic systems persistently displaced from chemical equilibrium. We eat and excrete, as did our remote ancestors. Energy and matter flow through us, building up the complex molecules that are tokens in the game of life.”[45]
An Autocatalytic opened thermodynamic system is not just a system that reacts and allows energy and matter to flow in and out of it, but that self-organizes and has the capacity to catalyze its own reproduction[46]. A good example of these complex systems are cells.

“Life emerged, I suggest, not simple, but complex and whole, and has remained complex and whole ever since - not because of a mysterious Élan Vital, but thanks to the simple, profound transformation of dead molecules into an organization by which each molecule’s formation is catalyzed by some other molecule in the organization. The secret of life, the wellspring of reproduction is not to be found in the beauty of Watson-Crick pairing, but in the achievement of catalytic closure. The roots are deeper than the double helix and are based on chemistry itself . So, in another sense, life, - complex, whole, emergent - is simple after all, a natural outgrowth of the world in which we live.”[47]

Profound transformation of dead molecules:

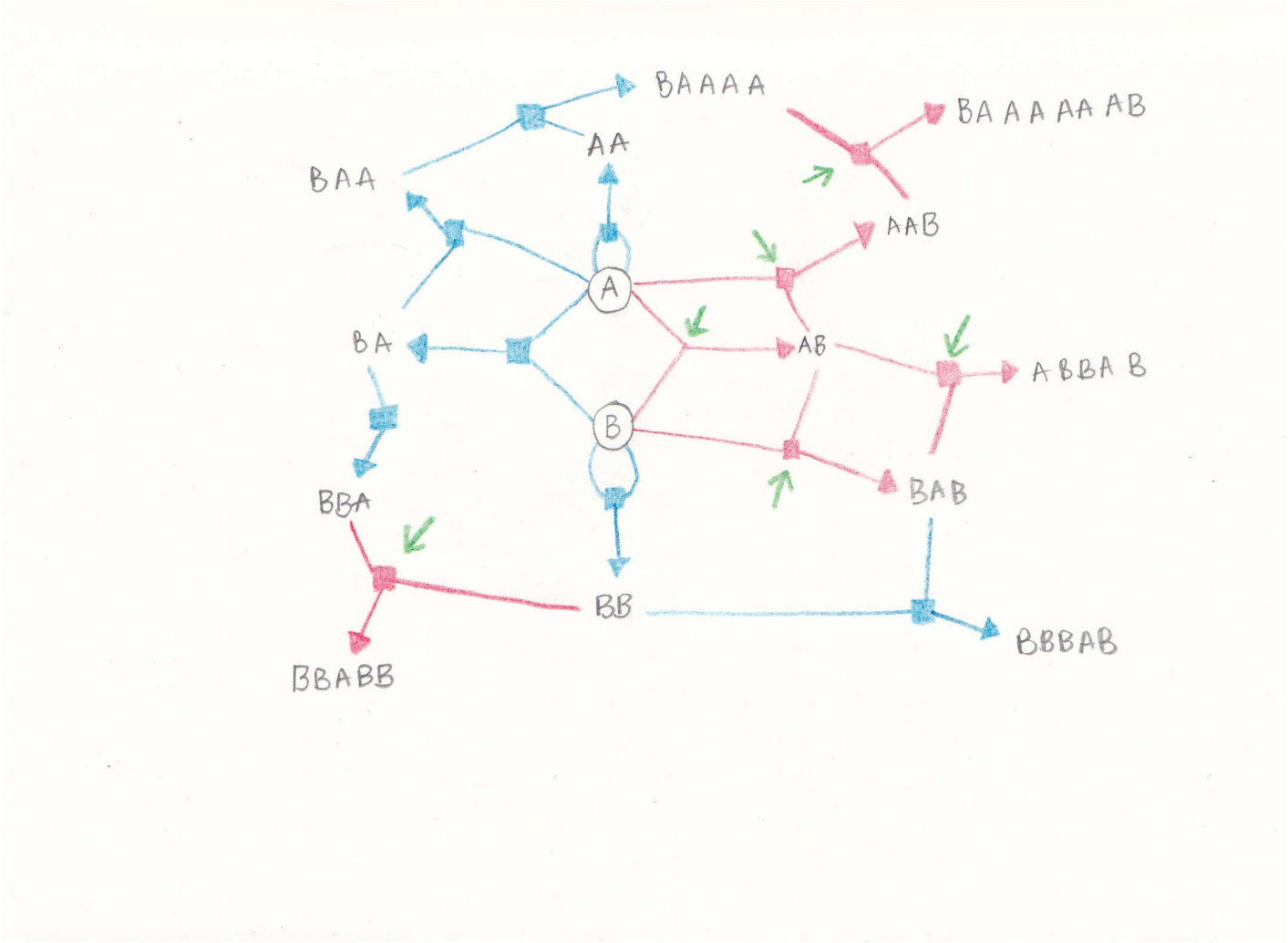
Kauffmann is using the word “dead” as a metaphor, as an image to describe a molecule outside of a living system, a molecule that exists but is not yet part of living matter, of the autocatalytic opened system. I will be taking advantage of this metaphor for my own theory. The profound transformation this molecule has to go through is from dead to living, it has to take the step into the living system, for example, as the substance (matter) that the opened organism allows entering and integrates into the system. But it can also be the start of the living organism. It was, following this thought, a collection of dead molecules that created the first autocatalytic self-organized opened metabolism, and therefore created life. How did this collection of dead molecules become a living organism? What pushed them to become organic compound molecules? I state it is the Force of Embodiment. Kauffmann explains this idea with the image of a network of chemical reactions.

“How likely is it that such a self-sustaining web of reactions would arise naturally? Is the emergence of collective autocatalysis easy or virtually impossible? Do we have to pick our chemicals carefully, or would about any mixture do? The answer is heartening. The emergence of autocatalytic sets is almost inevitable.”[48]



Original in: Stuart Kauffmann, At Home in the Universe (Oxford University Press, 1996), 59

Reaction graph: smaller molecules are combined to create larger molecules. The longer molecules are broken down again into the substrates which they are made out of. A mesh of interlinked reactions is created. This reactions happen spontaneously and are reversible in Kauffman´s example.



Original in: Stuart Kauffmann, At Home in the Universe (Oxford University Press, 1996), 60

Reaction graph: possible outcome of adding catalysts to the former reaction graph.

Once the diversity and length of the molecules increase, the chemical reactions between them (the lines in the graph) increase too, thereby creating a mesh of molecules and reactions which becomes denser and denser as the sets of molecules become more complex. These reactions (for example molecules transforming into new molecules) inside of the mesh are spontaneous. For it to become a self-sustaining autocatalytic network, molecules need also to act as catalysts to speed up the reaction.

“The system is fecund, but not yet pregnant with life, and will not become so until we have a way to determine which molecules catalyze which reactions.”[49]

Kauffmann gives in his texts some examples of chemically and mathematically possible ways of catalysis inside this scheme, and the result of all of them is inevitably an autocatalytic system.

“But for the reaction to “catch fire” it needs to reach a certain amount and diversity of molecules since the chance of catalysis depends on this diversity and atomic complexity. Life crystallizes at a critical molecular diversity because catalytic closure itself crystallizes.”[50]

ATOMIC REINCARNATION AND AUTOCATALYTIC SELF-ORGANIZED OPENED SYSTEMS

In atomic reincarnation , the “dead” atom transforms into a “living” atom. As I quoted before, there is a profound transformation of dead molecules that takes place in a system while it transforms from dead molecules to complex molecules able to auto-catalyze themselves by self-organization and chemical reactions hereby becoming a living, self-reproducing chemical system. This would mean, that the reason for a system to become alive is neither biological nor religious, but chemical. It completely depends on probability and chemistry working together, and the capacity of auto-catalyzation, which might take place following the steering Force of Embodiment.

I even dare to imagine the possibility of a molecule being auto-catalytic through the F.E, or even, the F.E acting as the catalyst. Kauffmann calls this new way of thinking the new sciences of complexity and claims that it may help us “find anew our place in the universe, that through this new science we might recover our sense of worth, our sense of the sacred.”[51] In this sense, it would be actually true what physics says about particles inside of the proton: they are all exactly the same. It does not make any difference inside of the proton to be part of living or non-living matter. Crystal or living membrane, there is no inner difference. Matter is just matter, and it lives only because complex molecules are built out of carbon atoms when reacting with other elements.

The atom itself is not alive, it responds to stimuli, it makes decisions , it reacts because it is triggered by the Force of Embodiment, but it is not alive until it is part of a complex molecule, or in this case, part of an autocatalytic organism. Kauffmann leads his theory on a path that takes the “dead” atom through a journey of being dead → reactor → catalyst → molecule → complex molecule → autocatalytic system → self-reproducing system → dead , which means, it proposes the possible mathematical and chemical reason of life being simpler than we thought it might be. It is a theory of atomic reincarnation “born not of mysticism, but of mathematical necessity.”[52]

Kauffmann´s theory does not exclude the theory of atomic reincarnation and the hypothesis about the existence of the Force of Embodiment. The idea of looking into chemistry and statistics for the seed of life could even complement it when looking at it from the perspective of life being possible not because of an external reason to matter, but an internal force that matter carries within itself. It is, in fact, each atom that builds each molecule. In an open thermodynamic system, matter flows in and out, as well as energy. Every molecule introduced to the system or cycle , either because of necessity, for example, food molecule, or because it is attracted to it by other forces (like the first ever living molecule, which, according to Kauffmann should have been a collection of loose “dead” molecules at first which organized, reacted and self-catalyzed themselves to life) is at first dead. By becoming the organism or just floating through it, interchanging energy and transforming into dead matter again (food molecule), it gets to be alive, even if just for the time it takes to cross from one end of the system to the other. Following this thought, every hydrogen atom released by the explosion of the big bang, ultimately had the capacity of transforming into life, according to Kauffmann not only on this planet and in the form we know, but anywhere where it was lucky enough to find other atoms to build molecules, and (enough) other molecules to build a non-equilibrated mesh of interconnected reactions capable of auto-catalyze and reproduce. The reason being, once again, intrinsic to the atom itself.

“Nature is material. We can break it down without it losing its material properties. We talk about smallest parts, that we cannot dismantle into smaller pieces. Atoms, that are infinitely hard to some extent. They should have the property to stay identical with themselves throughout time. Through the temporal continuity of matter the continuity of the world is guaranteed. The observable changes in the world occur through reorganization of these smallest particles. From our point of view: Matter is primary, it does not change; form, the gestalt is however secondary, it develops out of the structure of the relation of matter, the interaction of matter, and this changes constantly throughout time” [53]

For my hypothesis about a fourth force, Kauffmann’s theory would explain mathematically, statistically and chemically how atoms go in and out of the cycle. For this, they transform their state, from dead (or pure element that does not interact, is in equilibrium and therefore not alive) to reactor (the first action of the F.E, which steers it to become a catalyst), to molecule, which becomes a complex molecule through the theory of autocatalytic system that is able to self-reproduce itself and at the end of the cycle, when the equilibrium is reached, is again dead.

“The god particle is the Higgs Boson. Let’s leave God out of it, he has nothing to do with it. there is nothing that differentiates the union of protons in a living or non-living element. Particles interact with each other creating different states, like this table, that metal, etc. It is an accumulation of a large number of atoms that make up materials. It is a much more complicated and complex structure which makes up the material, and it is an association between all of them, like society. Individuals are different among them and it is their accumulation that makes up a country or a society. Here we have an interaction that is called living matter or non-living matter. And it depends on certain chemical elements that allow it to develop into what it is. That it develops into iron or it develops into wood. Carbon allows the development of more complex structures, which might be the principle of life. It is the architecture of the molecule which enables life. Carbon might be part of a diamond that is pure carbon or it might combine with hydrogen creating a much more complex structure that develops into life. We don´t understand yet the transition from one into the other. How we go from a relatively easy composition of one element into something much more complicated like the DNA structure. This is not part of the research here at CERN, but it doesn’t lack our interest”[54]

George Mikenberg, Personal Communication, 20.December 2016, CERN, Geneva

Anonymous. God as Architect/Builder/Geometer/Craftsman, The Frontispiece of Bible Moralisee.
Circa 1220-1230.
Österreichische Nationalbibliothek, Vienna.

S C I E N T I F I C C O N C L U S I O N

According to the thought chain I have developed throughout this hypothesis, there is an intrinsic fourth fundamental force in matter. This force is different from the other three forces - the strong force, the electromagnetic or electroweak force, and the gravitational force- but it acts in combination with them. It is difficult to state where the Force of Embodiment is located inside of the system or atom, but it is possible to state that it acts most probably on the electrons, next to the electromagnetic or weak force, since it is them who bind molecules that will later become complex organic molecules or inorganic matter.

The strength of the F.E will have to be more than the gravitational force, which is the weakest out of all of them, but less than the electromagnetic force, since in a chemical reaction the F.E will have not much power if the electromagnetic magnitude in the reaction is much higher. Nevertheless, it will continue acting on the atom for the reaction to achieve the expected results (for it to bind correctly the new molecule or body).

This force acts only on matter which is not in an equilibrium state since it is only when a system is looking for equilibrium that it needs the inner steering to look for the equilibrium and transform from one state of matter to another or to reincarnate into a new body. When the new molecule is already bound, the Force of Embodiment will be a combination of the singular forces inside each part or atom, thus resulting in a much higher force. Something similar to the gravitational force, which is related to the size of the object since it is the mass and volume of the body that will shape the space around it.

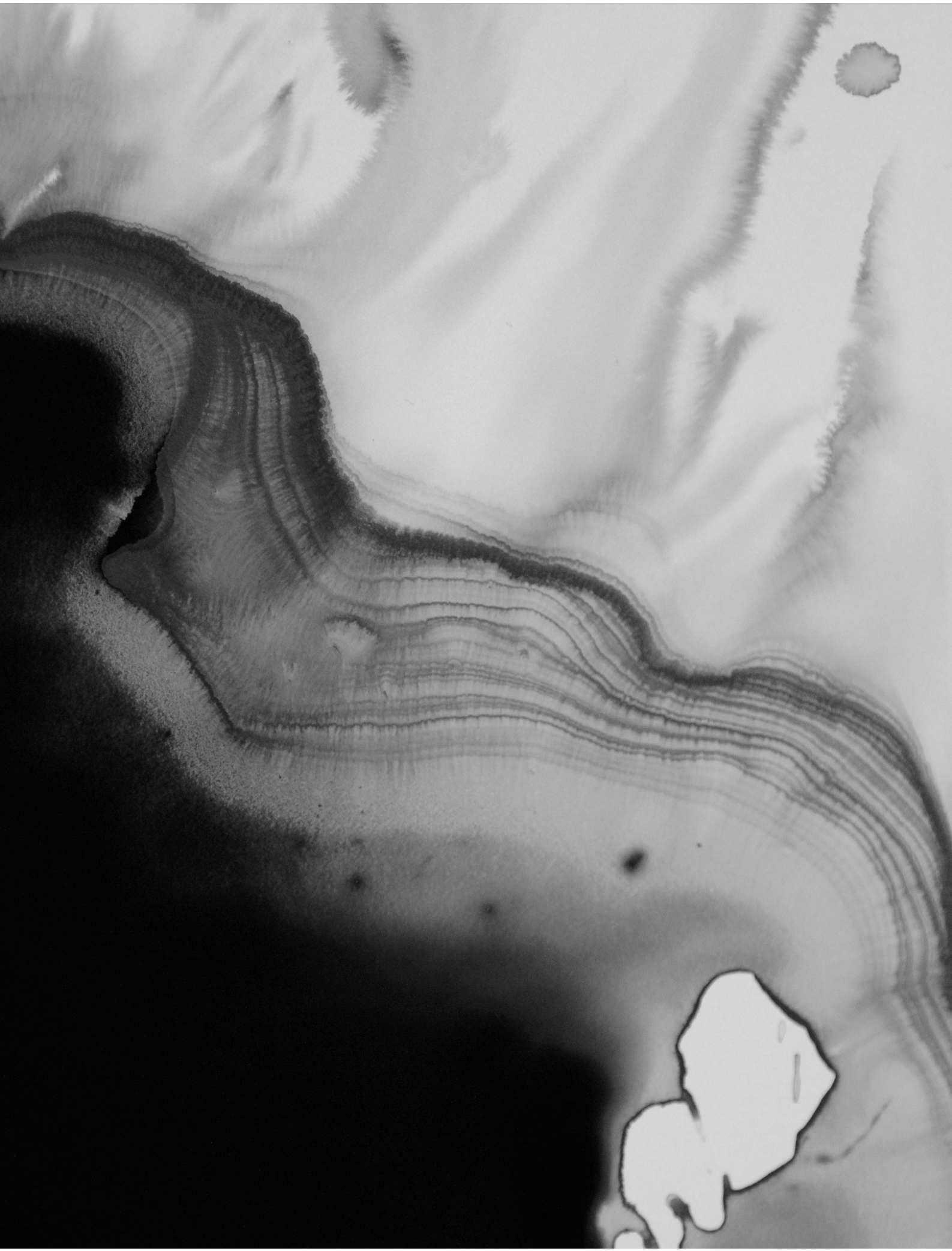
To be able to measure the F.E, a long period of time is needed. Since the force works on every atom, for example, of carbon, and this atom reincarnates or embodies a new form depending on the surroundings and the interaction it has with other atoms. We would need to be able to measure the Force of Embodiment inside of an atom of carbon from its birth, (which could have been millions of years ago out of an exploding star) to the same atom of carbon binding one of the DNA strings for example on our human skin.

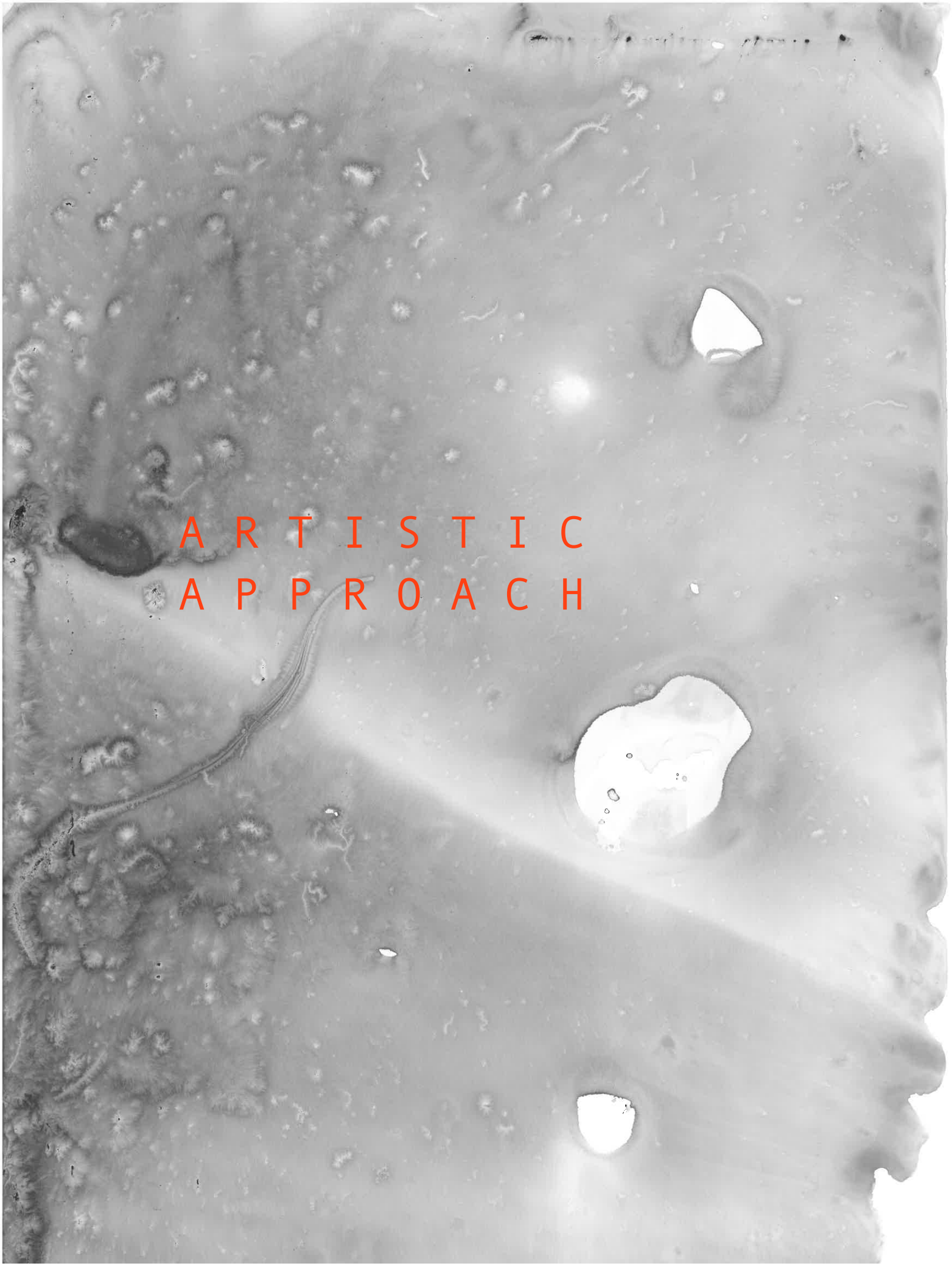
The task of the Force of Embodiment is to determine which form the atom will create next in the cycle of atomic rebirth . It is the steerer of matter, the decisive force which gives the binding of the atom a purpose. Compared to Max Tegmark’s theory of consciousness as a state of matter, it could be said that the Force of Embodiment is the consciousness in matter itself. And using Kauffmann’s theory of autocatalytic, self-organizing metabolisms to explain the existence of life, I dare to say that it is together with chemistry and statistic, the Force of Embodiment which catalyzes a reaction to life.

I have introduced my hypothesis about a fourth fundamental force in nature and about the inner capacity of matter to reincarnate with the hope of opening a dialogue between the world of particle physics and the world of fine arts. I presented the current state of research (as far as I can understand it) about the knowledge of the fundamental forces and I have introduced or made reference to ideas and words of belief systems, far away from scientific systems , for example, the symbolism of “ reincarnation”. I have used language from both thought collectives, being immersed more in one than in the other; standing in the scientific world of particle physics and using the artistic perception and point of view to produce an idea about the basic understanding of matter, not in an artistic or philosophical or religious way, but in a research-based-physical way.

Along the way, I learned about time, matter, space, mathematics, formulas, theories, words, forces, particles, accelerators, behavior, and many other things I would not have dug into if not for the sake of art. I conclude that the world of particle physics is also about believing , about following one’s instincts and jumping into the abyss without knowing what’s down there.

I conclude, as an artist, that I have found the reason for matter to be alive or not, and the way an atom is being constantly re-born or embodied in new matter. I conclude, as an outsider of the physics world, that every question can be answered, it only takes time since with time new technology is developed and this particular world relies completely on the technology there is at hand. Imagination is, in both cases, a big part of it. Anything imagined can be transported to reality through arts, and for the case of physics, if it has a reason to be imagined it will be brought to reality through theories and experimentation.

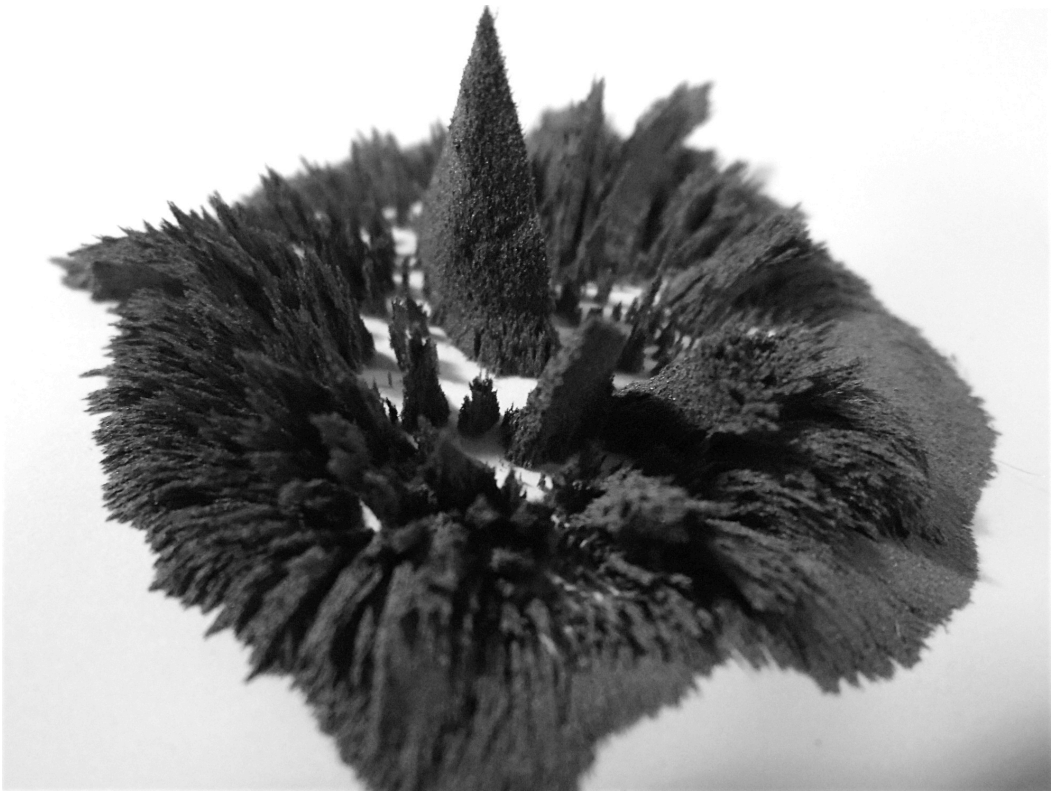




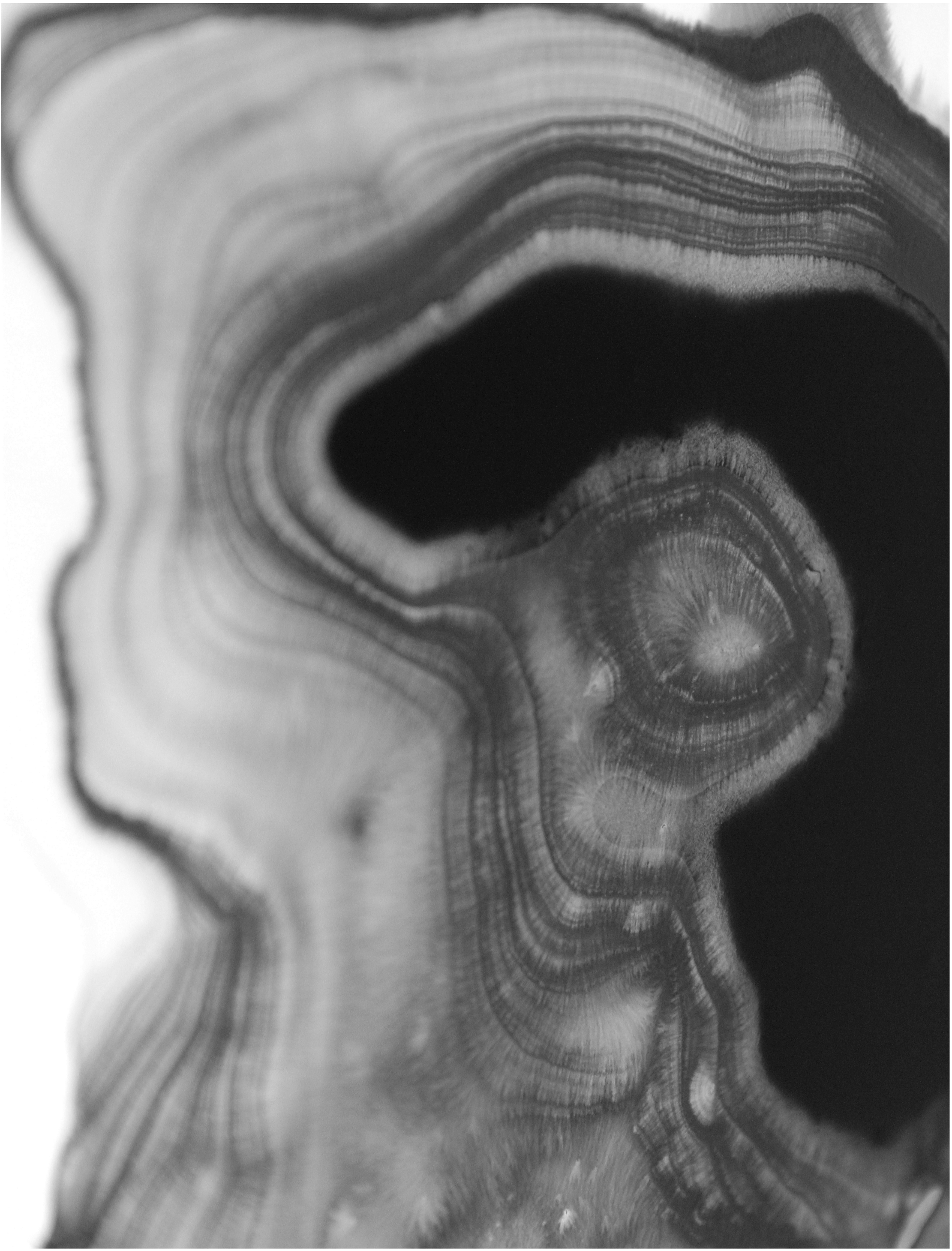
ARTISTIC APPROACH

“I shall argue that the distinction between a “living planet” - one that is geologically active - and a living cell is only a matter of definition. There is no hard and fast dividing line. Geochemistry gives rise seamlessly to biochemistry. From this point of view, the fact that we can’t distinguish between geology and biology in these old rocks is fitting. Here is a living planet giving rise to life, and the two can’t be separated without splitting a continuum.”[55]

Lane, N. The vital question: Why is life way it is?



Experimentation with Iron powder and its difference with iron in the blood



THE ARTISTIC APPROACH

I will research the Force of Embodiment with some of the most basic artistic materials, and again, I will reaffirm my intention of doing this out of my own curiosity more than my scientific knowledge, therefore I have chosen materials that are not far away from my known working methods: ink, water and paper.

More than 70% of the surface of the earth is covered in water, and it exists in liquid, solid and gaseous state. A water molecule is a basic bond between hydrogen and oxygen, and this bond is the most important solvent for the existence life (e.g blood, digestive juices, etc). I have chosen water because of its composition and the possibility of tracking back the origin of its building elements. Also it is visible at plain sight that water molecules have the capacity of constant change, they are being reborn and changing their body constantly. I have mixed water with black ink, with the aim of making the process it undergoes in the experiment visible. I have chosen to work with black drawing ink, a liquid material, basically consisting of pigment particles (in this case carbon, thereby resulting in a black color) dispersed in a solvent. The solvent is, in this case, a mixture of many ingredients, but the biggest amount of one element in this mixture is water. It is a water-based black drawing ink. Not far from any artist.

The paper I used for this research is a combination of calcium-carbonate (Stone) and High Density Polyethylene (Recycled plastic bottles), which is a polymer made out of hydrogen-carbon bonds of atoms.

All the elements I have chosen to develop this research are composed of hydrogen-bonded molecules. Other elements essential for my hypothesis and for my experimentation are carbon, oxygen and calcium. This means, every element in the research has been reincarnating in different bodies (living and nonliving) for millions of years.

T H E
R E S E A R C H

Water and Ink in a solid state of matter melt and evaporate on a calcium-carbonate sheet of paper

Research Question:

Can the Force of Embodiment be made visible by analyzing and interpreting the reaction between - and the traces left behind by a water-ink mixture on stone-paper?

Hypothesis:

During the creation of the stains on the stone-based paper and the evaporation of the reacting elements, all the molecules that are part of the initial reaction have been reborn due to the Force of Embodiment. The hydrogen, oxygen, carbon and others that are, at the beginning of the experiment, water, ink and paper, are at the end of the experiment part of the stains on the paper, of the air around the paper and of the living bodies watching the experiment.

Experiment:

A mixture of water and black ink, starting as a solidified liquid (ice) melt and dry on stone-based paper. Every experiment has started on different times, the first one beginning 48 hours before the last one, with the aim of incorporating a time-variable in the experiment.

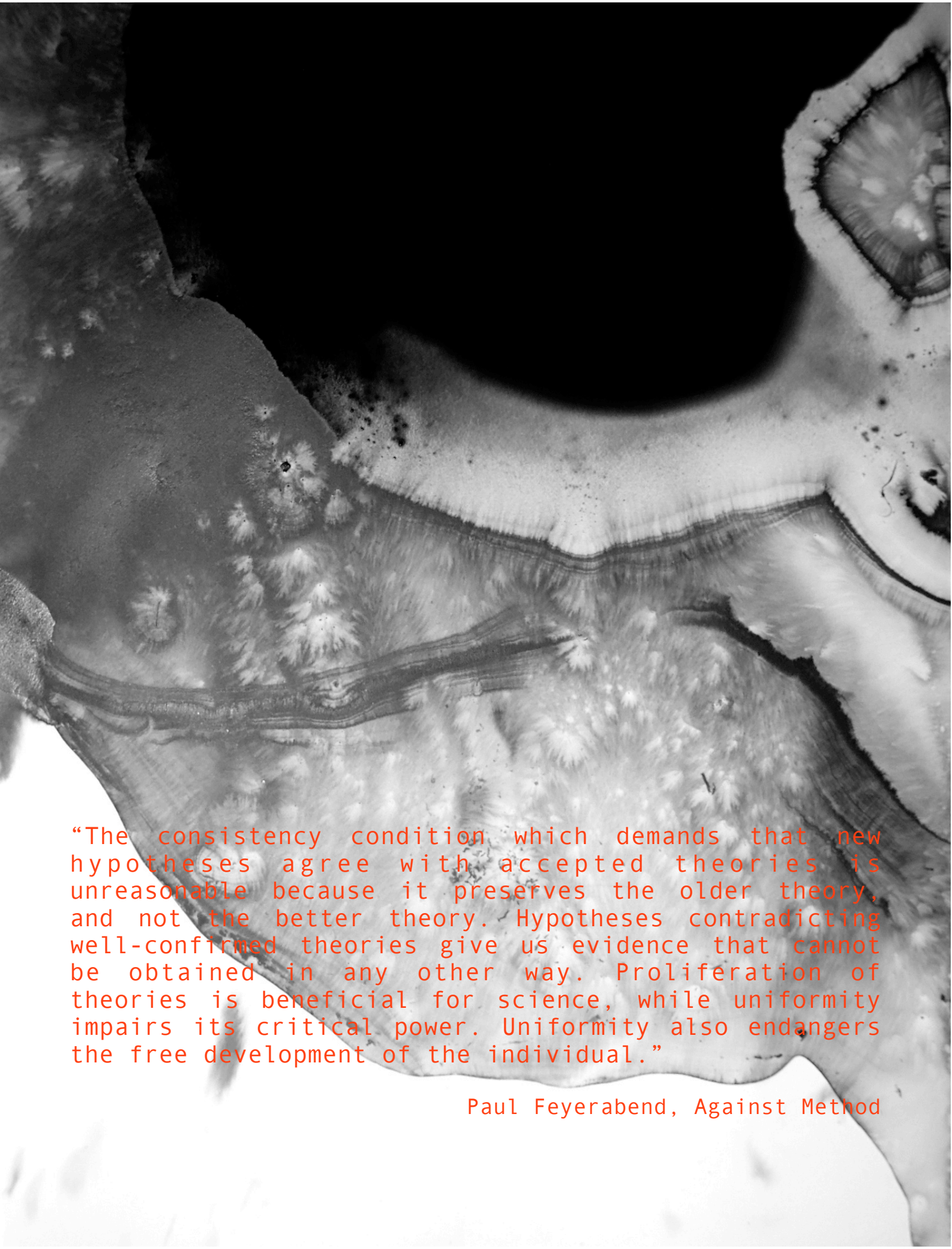
Observation:

The four fundamental forces (Gravitational Force, Strong Force, Electroweak (Electromagnetic) force and the Force of Embodiment) are working together to create the visible two-dimensional stains, textures and forms on the paper as well as transforming the elements from their initial states (water, ink, paper) to the final state (air, stain, living matter).

C o n c l u s i o n :

The body of the elements has changed, the atoms and molecules of the initial compounds have reincarnated. Some of them into a two-dimensional stain, others into the air around the paper, and some of them even becoming part of the living bodies of the people breathing the air while the process goes on. Hydrogen, Oxygen, Carbon and Calcium atoms and alliances have reacted and shifted to become a new body. The “original body” (this means, the one at the beginning of the experiment) is completely gone and it has left something else behind. The atoms of hydrogen in the water-ink mixture that were created at the big bang have now evaporated to become part of the air around the paper, which afterwards probably ended up being inhaled by me, and were also absorbed by the lungs of the people present during the experiment.

I conclude as the end of the exposed chain of thoughts around the present experiment, that the Force of Embodiment inherent to the the components of it, together with the other fundamental forces, has made them change their form, and incarnate in new bodies.



“The consistency condition which demands that new hypotheses agree with accepted theories is unreasonable because it preserves the older theory, and not the better theory. Hypotheses contradicting well-confirmed theories give us evidence that cannot be obtained in any other way. Proliferation of theories is beneficial for science, while uniformity impairs its critical power. Uniformity also endangers the free development of the individual.”

Paul Feyerabend, Against Method

What you are looking at is water and ink. Drying, evaporating, changing. What you are looking at is hydrogen, oxygen, carbon, calcium and a little bit of other elements reacting. The simplest materials, the most common elements in the universe, reacting right here, in front of your eyes.
Look closer.
They are mutating.
They are not just reacting; they are being transformed.
The liquid you see is a mixture of water (composed of hydrogen and oxygen) and basic carbon-based drawing ink.
For the transformation, mutation, reincarnation, call it as you want, the mixture is reacting on a stone-based paper sheet. Stone paper is made basically out of calcium-carbonate and recycled plastic. It does not absorb the water; it evaporates completely into the air around the paper.
The particles, atoms and molecules that compose this liquid start changing.
Something is going on; they are acting different than before.
In the process, which takes time, sometimes up two a few hours, the mixture dries leaving back a complex stain on the paper. Look closer, go as near as you can to the paper.
Can you smell the ink?
After a while the water is gone. Completely. Where did it go? How did it change?
I have a hypothesis.
The state of matter, and the hydrogen that used to be part of the water molecules, and of the ink molecules, has changed.
I think, there is something steering this hydrogen atom to be part of the liquid, and afterwards part of the wet stain on the paper, and afterwards part of the air around it.
Let me tell you about hydrogen. The simplest element in the periodic table was born around 300.000 years after the big bang. The first encounter of one proton and one electron created 75% of the known universe.
Now, follow my thoughts.
The water evaporated. The hydrogen atoms went back to the air around the paper.
That same paper you were smelling before.
The hydrogen has flown into your lungs.
Did it change? Did it become alive once it became part of your blood? Is blood alive? Is the hydrogen in your blood more alive than the one still drying on the paper?

According to my research, and according to science, it is. Even if you think that any of the atoms and particles building your living body is different than the ones building non-living matter, the calcium in your bones and the calcium in the paper, the carbon of your DNA and the carbon used to create the ink, according to physics, are the same.
What changed?
Something made one of them become blood, and another become air.
Just observe.
It's obvious.
I had to draw my own conclusion.
My own hypothesis about matter.
I believe, that there is a fourth fundamental force in nature.
This force is different from to the other three forces - the strong force, the electromagnetic or electroweak force, and the gravitational force - but it acts in combination with them.
I call it the Force of Embodiment.
It is difficult to state where the Force of Embodiment is located inside of the system or atom, but it is possible that it acts most probably on the electrons, next to the electromagnetic or electroweak force, since it is them who bind molecules that will later become complex organic molecules or inorganic matter.
It is the atoms' intrinsic self-organizing mechanism, force, drive, or even atomic entelechy and it pushes it to build the molecule it will be part of.
I contemplate the world and see it working, the force of embodiment.
There's nothing science can do with this force, because it is not a part of their theories, mathematical equations or observations. It is not essential.
Look at the stains.
They continue to leave a beautiful complicated drawing. See for yourself. The drawing, I believe everyone would agree, is different than our blood.

I have taken you on a journey through the discovery of a new force.
I have proven, with the tools at my hands, the reincarnation of matter.
What would happen if I were to change the hydrogen atoms used at the Large Hadron Collider at CERN for hydrogen atoms of living origin? Would it change the results? Would it change the theory?

I have introduced my hypothesis about a fourth fundamental force in nature and about the inner capacity of matter to reincarnate. I presented the status of research (as far as I can understand it) about

the knowledge of the fundamental forces and I have used language from both thought collectives, art and science, being immersed more in one than in the other;
I stand in the scientific world of particle physics and use my artistic perception and point of view to produce an idea about the basic understanding of matter and its behavior.

Now, we have seen the mixture of water and ink dry, we have witnessed it change and its atoms become part of the air that surrounds the paper, and finally, we have inhaled these atoms, and now, thanks to the Force of Embodiment, they are part of our living body.

NOTES

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[2] George Mikenberg, Personal Communication, 12. October 2018, Vienna-Geneva

[3] Ruth Nanda Anshen, World Perspectives (London: G. Allen and Unwin), 16.

[4] George Mikenberg, Personal Communication, 20.December 2016, CERN, Geneva.

[5] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 38.

[6] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 38.

[7] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 33.

[8] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 32.

[9] Paul Feyerabend, Against Method (Verso, 2010), 15.

[10] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 35.

[11] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979),24.

[12] Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 20.

[13] European Organization for Nuclear Research.

[14] ATLAS is one of two general-purpose detectors at the Large Hadron Collider (LHC). It investigates a wide range of physics, from the search for the Higgs boson to extra dimensions and particles that could make up dark matter . (CERN Accelerating science. Accessed April 29,2019, https://home.cern/about/experiments/atlas).

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[17] Personal field diary, CERN, Geneva, 2016.

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[20] Ernesto Cardenal, Cántico cósmico (Madrid: Editorial Trotta, 1992)

[21] Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979), 95.

[22] Bruno Latour, Science in action (Harvard University Press, 1987), 15.

[23] Paul Feyerabend, Against Method (Verso, 2010), Analytical index.

[24] Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 26.

[25] Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 8.

[26] “I could not make out whether these regular bodies were associated with the elements merely as symbols - for instance, the cube with the element earth so as to represent the solidity and balance of that element - or whether the smallest part of the earth were actually supposed to be cube-shaped. In either case, the whole thing seemed to be a wild speculation” , Heisenberg,Physics and Beyond., 8.

[27] Paraphrasing Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 8.

[28] Paraphrasing Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 8.

[29] Paraphrasing Werner Heisenberg, Physics and Beyond Encounters and Conversations (Harper & Row, Publishers, 1971), 12.

[30] “Thomas Theorem,” Oxford Reference. Accessed April 29, 2019 http://www.oxfordreference.com/view/10.1093/oi/authority.20110803104247382.

[31] “The truth and the driving force behind rebirth is what is called karma. Karma is often totally misunderstood in the West as fate or predestination; it is best thought of as the infallible law of cause and effect that governs the universe. The word karma literally means" action ,"and karma is both the power latent within actions, and the results our actions bring”. Sogyal Rinpoche, The Tibetan book of living and dying (San Francisco, CA: HarperSanFrancisco, 2013), 110

[32] “an idea that is based on feeling and for which there is no proof” Hunch Meaning in the Cambridge English Dictionary. (n.d.). Retrieved from https://dictionary.cambridge.org/dictionary/english/hunch

[33] Sogyal Rinpoche, The Tibetan book of living and dying (San Francisco, CA: HarperSanFrancisco, 2013), 94.

[34] "Consciousness as a State of Matter," Max Tegmark, accessed April 29, 2019, https://www.youtube.com/watch?v=MjhEtqhUZkY.

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[46] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 49.

[47] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 48.

[48] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 61.

[49] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 63.

[50] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 64.

[51] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 4.

[52] Stuart Kauffman, At Home in the Universe (Oxford University Press,1996), 69.

[53] Hans-Peter Dürr, Geist, Kosmos und Physik: Gedanken über die Einheit des Lebens . (Amerang: Crotona, 2013), 32.

[54] George Mikenberg, Personal Communication, 20.December 2016, CERN, Geneva.

[55] Nick Lane, The vital question: Why is life way it is? (London: Profile, 2016),27

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