FREE BOOK

THE **PROBABILISTIC ORIGIN** OF THE UNIVERSE

MY FIRST APPROXIMATION ANALYSIS OF THE UNIVERSE & ITS COSMOLOGY, TOGETHER WITH CONSCIOUSNESS & ITS EMERGENCE. MODELED VIA MATHEMATICAL EQUATIONS IN A QUANTUM CONTEXT, AS A POTENTIAL PRECURSOR TO THE STANDARD MODEL OF PARTICLE PHYSICS.

by T. Filimon

"The Quantum-Probabilistic Origin Of The Universe" This is the 3rd edition - November 2024 (2nd edition - August 2019, 1st edition - May 2018) Copyright © 2018-2024 - Book, cover and book design by T. Filimon BIC Subject Category: PGK (Cosmology)

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Paperback originally published via Kindle Direct Publishing - www.kdp.amazon.com - Currently published via https://docs.google.com/document/d/1HqkgxDuDBrmBMFNA8_9MDm27q_Bx6-c6GVssEMh1vUI

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If you read this book, read it as it is, with good judgment and pass it through your own discernment. The book deals with some heavy topics like consciousness and the nature of reality. No: reality is not a simulation (nor does this book claim anything like that) and no: if you do find out the true nature of the universe you won't be able to fly like a bird. Once Newton conceived his laws of motion he wasn't suddenly able to levitate.

Take care of yourself and your body. Eat healthy. Live long and prosper.

ASIN 1089486952

Paperback ISBN 9781089486954



I dedicate this book to those who have heard me talk about it while I was writing it. I assume it's not easy to hear some crazy guy having ideas about the world being made up exclusively from mathematical probabilities.

Table Of Contents

Preface	5
In The Beginning There Was… What Exactly?	9
Conway / Kochen's Theorem Of Free Will	12
Ubiquitous Consciousness	16
Conjecture 1: Reflexive Uncertainty	25
Axiom 1: Concurrent Observation	31
Theorem 1: Perceptually-Limited Observers	34
Theorem 2: Probabilistic Nature Of The Universe	36
The Probabilistic Representation Of The Universe	42
Conjecture 2: Fractal Nature Of The Universe	50
The Mathematical Emergence Of Consciousness	55
Recurring Spatial Patterns	63
The Arrow Of Time	80
Conjecture 3: Sync-Based Attraction & Interaction	87
Multiple Dimensions	102
On-Point Interpretations	113
Schrödinger, Shakespeare Of Physics	116
"The Universe Is Flat"	119
Superpositional Semantics	121

Venn Diagram Of Constructs	123
Notation Of U∞	124
Recurrence & Increasing Bias	125
Akashic Record	127
Dark Matter & The Speed Of Light	128
Theorem 3: Conservation Of Entropy	130
Drake's Equation vs. the Fermi Paradox	133
Antimatter (and why it "lost" to Matter)	140
Archimedes: "Give me a place to stand…"	141
Consciousness vs. Probability	142
Bibliography, References, Recommended Reading	145
Afterword	146

Preface

We are each and every one of us probabilistic underdogs. We are so unique, individually, that we were extremely unlikely to exist, yet here we are.

This book goes beyond its title, of *Probabilistic Origin*, to create a profound mathematical model - a probabilistic representation of the universe, essentially describing the world as a mathematical emergence and classifying phenomena such as space or time as constructs or local properties.

I am a Software Engineer. I had an early passion for technology, surrounding myself, as a child, with A3 sheets of paper that I used to draw Star Trek sensors on. I continued on this road creating some awarded mobile productivity apps when Android was at its beginning, making contributions to several IT magazines and engaging myself with the developer community. I created popular websites, gadgets, and programs. Although I was born to be a software engineer, I dare say I have some knack with mathematics and some understanding of quantum physics - enough to give me, perhaps, a new perspective - a programmer's perspective on what surrounds us. This book is the result of years of thought on the nature of consciousness and on the origin of the universe. These "incursions" resulted in a collection of revelations which, in the end, coagulated, unexpectedly, into a unified theory. I didn't think about writing this book, I wrote this book because I thought; it will be a formalization of my revelations; I sincerely hope this word is not too pretentious - for me, they were spine-tingling moments.



This book contains roughly: 60% cosmology, 25% ontology, 45% graph theory, 40% set theory - these numbers are just from the top of my head, perhaps not entirely accurate in these proportions. They all come together in what I hope is succinct and dense writing, but still well explained. Still, this is not an easy book to understand in its entirety. The main ideas are straightforward but nuances and details are both subtle and rigorous. If you're passionate about mathematics or physics, you might understand it all. It's not necessary that you understand it all either... It's entirely up to you.

You must know that I dislike pompous behavior when there is no reason behind it. I will not refrain from citing from Wikipedia in a couple of places on issues that are not of great complexity. Also, "I conjecture" sounds wrong to me (though it might be correct)... With your permission, I will henceforth say "I conject".



Part 1

Physical, metaphysical and mathematical context

in which I lay out my motives and the external influence that has led me here, not with the purpose of sharing my mental journey, but to try to outline the logical stepping stones that we'll need before we go on.

Chapter 1

In The Beginning There Was... What Exactly?

Some say in the beginning there was Light... Or the Word... Or God... Some others say it all started from the Big Bang. You will probably now expect me to say: "What if they are both right?". I will actually say: "What if they are both wrong?". I will, in fact, challenge these two titanic popular beliefs, which seem to circle each other in finding an answer but not quite getting there; much like certain scientific theories, as well as religions and philosophies, circle themselves without really "nailing", in my opinion, an explanation that is either plausible or useful for humanity on the grand scale of space-time. By humanity I mean this collective of ant-like creatures living on a planet that resembles an ant hill. I am only comparing vulnerability (not intelligence or capacity for organization, we would probably have a thing or two to learn from ants). We are so complacent in the size of our brains that we miss the point that it's all relative: not polluting ourselves to death and not being hit by some extinction level event (e.g. asteroid) should be top priorities, but we are more concerned with our social-media pics and our social-media international negotiations and our social-media life.



It's 2018. I would have imagined by now we would have eliminated polluting cars, set foot on Mars and cured unfair diseases. We haven't done these things yet, but it feels like we are, indeed, making baby steps in the right direction. For example, Elon Musk's heroic attempts are making me proud to be human. We need to pick up the pace¹. So let's stop procrastinating and let's figure out how this world works!

The purpose is constructive and selfless. It's the only way forward on a grand-scale. The purpose is free energy, understanding of the universe and unlimited travel. The purpose is the betterment of our species, of our planet, of our world and of our collective consciousness.

I propose classic theoretical constructs, however objective they might be considered in a certain group of smaller or larger size, can not be universally objective. They are formulated within a human (thus non-universal, localized) perspective. Newton was right but there was a bigger picture. Einstein was right but there is always a bigger picture. So let's for a moment stop taking small steps trying to understand our world starting from our dense surroundings; instead, let's turn things around and let's look at the universe in a top-down manner. Therefore, starting from this premise, I propose the conjectures, theorems and perspectives, on various phenomena, contained within this book.

P.S. Let's ask the big question: "How did all this come into existence?". The truly touching part is: we all intuitively know the answer, even before someone tells us of Big Bang or God. It just requires a bit of honesty and a bit of "unlearning what we have learned" in terms of temporary, dense concepts.

Question: *How did all this come to be?*

¹ An argument for humanity to stop being complacent and to become a spacefaring civilization: The Malthusian Theory of Population - exponential growth of population vs. arithmetic growth of food supply.

Answer: I don't know.

Let's start from that, as the validity of "*I don't know*", assuming it comes from a place of honesty, is 100% indisputable. Whenever someone says "*I don't know*", they say one of the "true-est" things and it requires no evidence for you to believe it. Well... It turns out the universe communicates in this manner as well, we just have to listen.

*

The following two chapters will be dedicated to those existing theories that will prepare the reader for understanding the next steps: I will then formulate a conjecture, an axiom and a theorem that will lay ground for my second and main theorem which supports and defines the probabilistic nature of the universe. The 2nd theorem offers a mathematical tool that allows for the modeling of the universe as a tree of probabilities, onto which I will then attempt to map material as well as abstract concepts, aspirations and physical laws that most people are familiar with.

Chapter 2

Conway / Kochen's Theorem Of Free Will

It will not be my purpose to burden this specific chapter with formal definitions and mathematical expressions; the free will theorem is a well known result that can be formally researched from well documented sources online, but I do feel it's important to at least quickly mention it because it attunes the reader's perception to the cosmological model that will be constructed in this book.

The theorem of free will was developed by mathematicians John H. Conway and Simon B. Kochen and it was first published in the *Foundations of Physics* journal (2006). A summarized statement for this theorem would be: If we have free will (as in: our actions and choices are not a function of the past) then so must elementary particles. They subsequently published *The Strong Free Will Theorem* in *Notices of the AMS*², strengthening the theorem by replacing one of the axioms it relies on with a weaker one. I will cite two phrases³ from their paper, in which they quite accurately but simply describe the theorem conclusion:

² American Mathematical Society, www.ams.org

³ Published in *Notices of the AMS*, Volume 56, Number 2



It asserts, roughly, that if indeed we humans have free will, then elementary particles already have their own small share of this valuable commodity. More precisely, if the experimenter can freely choose the directions in which to orient his apparatus in a certain measurement, then the particle's response (to be pedantic—the universe's response near the particle) is not determined by the entire previous history of the universe.

Expanding a bit on the subject (also with interpretations from the recommended video at the end of this chapter), one could say all particles have an infinitesimal quantity of free will which has the possibility to add up. For example, free will in a person might be evident, but one might ask: why doesn't a big rock or a car exhibit the same quantity of free will if every particle should have it? In inanimate objects, like a table or a chair, the free will of multiple particles cancels itself out, perhaps due to the random character of their construction. In what most⁴ would consider *living beings*, evolutionary mechanisms might have synchronized certain sets of particles to work together for various purposes (organs, circulatory system, nervous system, etc).

Personal observations on free will

And this is quite correct: when I was born, my anatomy was genetically inherited not just from my parents or grandparents, but from my entire ancestral line, which evolved through the ages to cope with the challenges of living and surviving. Taking this idea further, it's interesting to note how, while my anatomy is genetically inherited, the subsequent development of my body and mind has been dependent on how well my parents have taken care of me. So as we progress through our lives, we start depending less and less on these initial factors (ancestral line, parents) and we gradually take control of our own development (e.g. some people go to the gym to shape their bodies when they are not satisfied with how they look, some people take up reading

⁴ Most people living on Earth, cca. 2018, that is...

when they want to expand their mind). If this is indeed a pattern, it is perhaps reflective of a certain automatic emergence of free will.

Another observation I would like to make about free will is that I consider it a projection of the same force / phenomenon that projects consciousness, which I will treat in the next chapter. In it, I will also connect consciousness to the evolution of life and physical laws.

Personal observations on synchronization

Although I don't remember Conway / Kochen using the word *synchronization* to describe the case of infinitesimal free will adding up instead of cancelling itself out (i.e. the effect on free will that would be obtained through evolutionary mechanisms) I will emphasize the notion. I consider complex consciousness (to be precise, the human construct that most refer to when they use the word *consciousness*) a side effect of synchronization. Synchronization describes most systems, basic as well as complex, in a fundamental way. For example, synchronization isn't expressed only by similarity of construction and purpose (e.g. cells in the circulatory system) but also, for example, in orbital systems:

- a planet synchronizing its content and passengers around its own axis;
- a planet synchronizing its content and passengers around the Sun;
- a star system synchronizing its star and its planets around a galactic center.

Synchronization, too, will be detailed in tandem with consciousness in the next chapter.

Recommendations

- 1. The Istrail Laboratory of Brown University published a YouTube video where you can see John Conway himself holding a lecture on the free will theorem⁵.
- 2. Hyperreal numbers are an extension of real numbers that also contains infinitesimal and infinite quantities. Most notably I will use ω (omega), in some chapters, to model the behaviour of the cosmological model proposed by this book.
- 3. Surreal numbers (as constructed by John Conway and named by Donald Knuth in his book *Surreal Numbers: How Two Ex-Students Turned on to Pure Mathematics and Found Total Happiness*), although not used throughout this book, might also be an interesting concept to study.

As a conclusion for this chapter, I believe that the free will theorem is a strong supporter of the idea that the world is based on a basic and fundamental model rather than some arbitrarily complex rules. That complex behaviour might arise from a simple mechanism is a different aspect. We will dive into this mechanism, as well as its behaviour and content throughout the book.

⁵ Hopefully the video will still be online when you're reading this. If it is, you can find the section that refers to the free will theorem at 1:05:21

Chapter 3

Ubiquitous Consciousness

Where do we draw the line? What is conscious and what isn't? We can go with most attempts at a definition for consciousness, but we will soon realize it's not quite ok to draw a line. Is a human adult conscious? For sure, most would say. Is a human child conscious? Yes. Is a baby conscious? The ice is becoming thin, but still, probably yes. How about a fetus? Or an embryo? Can we specifically say no? Or yes? Isn't it somehow logical but also instinctive to say that a fetus should be more conscious than a cell, but less conscious than a child? I believe this is so. I believe these questions can't be answered with a definite yes or no because they are measuring a relative quantity.

Let's formalize the previous paragraph into a primitive and crude inequality, but with the purpose to highlight the idea of consciousness quantification / relativity:

C(cell) < C(baby) < C(child) < C(adult)

where *C* is the consciousness of any given entity. Should such a function exist, can we truly say it's only defined for members of the human species? Where would C(monkey) and C(baby - monkey) fit? They **would** fit somewhere in the chain of quantification / relativity. An indication towards this is the fact that if we instinctively write the

~

inequality only for monkeys:

C(cell) < C(baby - monkey) < C(monkey) we observe C(cell) in both statements. Let's go further:

C(plant), C(baby - plant), C(leaf) and, you guessed it, C(cell). It's perhaps not unexpected that the cell, the building block of all biological organisms that we currently know of, appears so often in our inequalities. But is it logical or even instinctive to think our inequalities should stop at the cell or even that they should be exclusive to biology? Is the cell not made of mitochondria, chloroplasts and other subcellular components and, ultimately, of basic substances and chemical elements?

This leads us to:

C(atom) < C(molecule) < C(cell),

C(atom) < C(molecule) < C(water / river),

C(atom) < C(molecule) < C(rock),

and so on... Furthermore, if consciousness (C) is additive, as all of these examples suggest, we can formally express collective consciousness as:

 $C(\sum_{i=1}^{n} E_{i}) = S(E_{1}, E_{2}, ..., E_{n}) \times \sum_{i=1}^{n} C(E_{i})$

where $E_1, E_2, ..., E_n$ are entities / objects / particles and S is the synchronization exhibited by the *n* entities, with $S: E \times E \times ... \times E \rightarrow [0, 1]$ where 1 represents perfect synchronization and 0 is utter desynchronization⁶.

S, as a coefficient, is necessary; quantities of consciousness don't simply add up, unless there is some synchronization of purpose. Furthermore: if consciousness is a function of synchronization, we could, in theory, attempt to calculate the consciousness of the Earth, of the Solar system and of the universe since synchronization is a fundamental and ubiquitous property (e.g. just by considering the pattern of celestial objects orbiting one another, we cover the observable universe).

⁶ If you are a butterfly-effect believer, you might argue that values should be within (0, 1] instead of [0, 1].



A small note on the measurement unit for synchronization:

 $[S] = \frac{[C]}{[C]}$ together with $S: E^n \to [0, 1] \Rightarrow S$ has no measurement unit as a simple coefficient, but since it can take values between 0 and 1, it can be associated with percentage. We will observe the [0, 1] / percentage pattern for other quantities in future chapters as well.

Synchronization is, perhaps, not easy to define mathematically. We intuitively recognize entities / objects in sync, but they can be both material (the particles that compose a planet spinning in sync around the planet axis) and immaterial (efficiently working together with a colleague); in addition, synchronization seems, at first glance, to have a certain subjectivity associated with it. Synchronization is not necessarily doing the same thing, but it can also result from complementary actions. After reading chapter 10, on *The Mathematical Emergence Of Consciousness*, it will hopefully not surprise the reader that I define synchronization as the level of additivity⁷ certain entities / actions have.

For example, let's look at the family unit from a mathematical / biological / darwinist perspective. People procreate to preserve the species. The offspring, in their infancy, are vulnerable but quickly learn to depend on parents, because of their genetic will to survive. Procreation, however, is a large-scale mechanism designed for the survival of the species. Therefore, we could say that individual survival instinct works in sync with procreation as a large-scale mechanism, with the ultimate collective goal of persisting / preserving the species.

I can only assume persistence is the goal of microscopic particles as well. This ties into particle-wave duality and universal states⁸ which will be detailed further in chapter 7, on the *Probabilistic Nature Of The Universe*. Again, this is only an assumption, but even at sub-atomic

⁷ The degree to which actions can be "added" together in support of a higher purpose ⁸ As in: state machine. The universal state machine will be detailed in the next chapters.



levels, waves seem to work together so that they can advance⁹ to particle-like states: electrons "want" to orbit protons and protons "want" to be orbited by electrons so they can explore, as atoms, further mechanisms to collapse wave components. Is it a coincidence that the simplest form of this subatomic, "mutually beneficial" relationship, hydrogen (its atom composed of a single proton and a single electron), is the most abundant chemical element in the observable universe?

That I used the word *want* in the context of a particle is no accident, because the circle would be complete and we could return to Conway / Kochen's theorem of free will, described in the previous chapter. This theorem, if you remember, asserts that particles can have infinitesimal quantities of free will. In chapter 2, I also associated the constructs of free will and consciousness as being projections of the same "cause". Based on observations made until now (and a few that will be made in the following pages), one could, perhaps, say:

- Free will is the bias (exhibited from micro to micro cosmos) to proceed to the next state in the universal state machine;
- Consciousness is the persistence of the current state (i.e. the electron knows its own particle-wave state or where in between it falls, its state is reflected persisted in its own degree of collapse).

Gravitation and electromagnetic force would then be spatial expressions of synchronization / additivity, which would explain the structure of the observable, three-dimensional universe. I will attempt to define additivity in chapter 10, as the mathematical cause that projects synchronization (as gravitation, electromagnetic force and other physical

⁹ An "advance" in the direction: stateless (wave) \rightarrow stateful (particle). I must note that this is not a binary state (either wave, or particle). I believe (and I hope to show this in Axiom 1) that waves, particles and everything in between do exist, as they are relative to the "beholder".

phenomenons in 3D and as complementarity / alignment of purpose beyond 3D).

Biological consciousness and human constructs

By now you will have probably realized that, at least in this view, just as biology is a concept larger than humanity, consciousness is larger than both of them. We will enrich the following Venn diagram throughout the book:



Venn diagram of constructs (version 1): Consciousness, Biology, Humanity

We already established the concept of will at particle-level and while we can't really say it's determined by consciousness, if we assume will is an entity's bias towards a more collapsed state, then consciousness is infused with will. Both act upon the same space and are complementary, yet they both have properties additional to the other. This difference will be explored further in chapter 10.

Love and fear, however, are biological constructs built around the persistence of life (its consciousness¹⁰) and its appetence to evolve (will). Humans imbue these concepts with so many nuances that their full human meaning is actually a human construct (but love and fear manifest themselves in other kinds of animals as well¹¹ - don't forget to apply the same kind of quantification that we applied to consciousness, to love and

 ¹⁰ A certain amount of collective consciousness of Self, even at the level of a species?
¹¹ I would actually say in most



fear. We may put humans on a pedestal regarding the complexity that we are capable of, but we exclusively own none of the properties that makes us great. There is nothing in our life qualitatively superior to other types of life on this planet. We only possess increased quantities of ubiquitous properties¹²). Perhaps it's no coincidence that, as we climb the ladder of reason from species less capable of it to species that glorify themselves because of it, combined with the short lifespan of the individual, this larger-than life meaning gets attributed to:

- Love as a mechanism for collective preservation and multiplication;
- Fear as a strategy for self preservation and survival;

both in the higher interest of persistence¹³. Note that all biological life, as we know it on planet Earth at the moment this book is being written, has an incredibly short span compared to surrounding non-biological elements: landforms, rocks, minerals, atoms, the planet, the star and so on... Interestingly, the lifespan of said elements continuously and gradually increases as we move from humanity outward to celestial bodies and systems.

¹² Which should make us think as a species: if we can't take care of life in general there will be a chance we can't take care of ourselves as a civilization. But I have to point out, although there have been severe accidents throughout history, like war, disease, famine, and some still continue to this date in 2018, we have *apparently* achieved a certain stability on planet Earth. Hopefully it's not anything temporary; we must all do our part to support it. War may still exist in 2018, but, hopefully, a future reader of this book will see this footnote from the other side of eradication of war. ¹³ And perhaps also will, but i'm afraid the subject of mapping will onto human feelings and thought patterns might be a bit too complex for this book and my means. Mechanisms such as adaptation, which might or might not be entirely evolutionary, come into play.



Venn diagram of constructs (version 2): +Will +Fear +Love

In chapter 10 the Venn diagram of constructs will incorporate flowchart components to describe the origin of consciousness and will.

The resulting consistency and simplicity of the universe triggers the necessity to find, if possible, what model governs its behaviour.



Part 2

Purposeful observations on how the world works

in which I attempt to identify basic truths, which, in their formal expression, will allow me to introduce (and subsequently build upon) the necessary definitions

Chapter 4

Conjecture 1: Reflexive Uncertainty

An observer can not completely observe itself.

Formal expression

Let us define a function E_r that represents entropy such that

 $E_r(d): P(U) \rightarrow [0, 1]$ where:

- *r* is the observe*r*;
- *d* is the observed;
- $E_r(d)$ is the entropy of d as observed by r;
- *U* is the universe (in the largest sense possible, including but not limited to space-time);
- *P*(*U*) is the powerset of U, therefore *r* can be any association of elements considered to constitute an observer and *d* can be any association of elements considered to constitute an observed object;
- [0, 1] is a convenient arbitrary interval which can supply values for *E* such that 1 is the maximum entropy of any particle / element / zone / object in the universe and 0 is the minimum (as observed by a particular observer)

I conject that: $E_x(x) > 0, \forall x \in P(U)$



Corollary 1

A valid perspective can not be defined where the observed is identical¹⁴ to the observer.

Corollary 2

Any localized perspective has to be by definition smaller than the universe¹⁵.

Corollary 3

The entropy of an observed object can not have an absolute value. It can only have a value that is established by an act of observation, therefore any value of entropy will be relative to an observer (in the E_r notation, $r \in P(U)$; the function is undefined without an observer¹⁶). It is of note that this mirrors the relativity of consciousness that will be detailed in chapter 10 (*The Mathematical Emergence Of Consciousness*).

Conjecture 1 (of *Reflexive Uncertainty*) is perhaps another form of expressing the Heisenberg uncertainty principle and the observer effect, although this conjecture is not necessarily equivalent to them: it brings the reflexive aspect into consideration. The uncertainty principle and the observer effect will be described shortly, followed by some examples.

[Heisenberg's] Uncertainty Principle,

Werner Heisenberg, German physicist, 1927

There is a limit to the precision with which certain pairs of physical properties of a particle, known as complementary

 ¹⁴ "Identical" means in this case: "the same", "itself", beyond mere congruence. In other words, one may attempt to completely observe itself but without success.
¹⁵ Observable and unobservable

 $^{^{\}rm 16}$ While the function is undefined without an observer, future chapters will reveal the importance of r= $^{\oslash}$

variables, such as position and momentum, can be $known^{17}$ - i.e. the more precisely the position of some particle is determined, the less precisely its momentum can be known, and vice versa.

The Observer Effect

The observer effect refers to the fact that the mere act of observation affects the observed object. For example, to observe an electron, photons must first reflect off it, but this means those photons will interact with the electron and change its behavior / path. Please note the consistency of certain physical laws from micro to macro-cosmos, for subjects both dense and subtle: the observer effect is valid with living individuals as well (has someone ever caught you singing? Or did you ever speak in front of an audience?), with communities and institutions, but also with celestial bodies. Yes: the Sun is *observing* Earth just as any star is observing its planets and just as any nucleus is observing its electrons.

Food for thought: If this triggers you a bit.. perhaps you could make an exercise in loosening your definition of *observation* to the degree that it becomes a generic process applicable to multiple elements in the universe, not just to a dense, three-dimensional pair of biological eyes. We will engage together in this exercise anyway, as you continue to read this book.

Examples

Coming back to the conjecture (of *reflexive uncertainty*), let's note a few examples from small to large:

- an atom can not *completely* observe itself the nucleus observes its electrons, the protons and neutrons within the nucleus observe each other and the surrounding electrons, but the atom itself can't be observed by itself alone; it might be observed by another atom, or molecule...
- a person can not completely observe its own body we simply can not be aware of every biological process with its plethora of

¹⁷ Citation from https://en.wikipedia.org/wiki/Uncertainty_principle

details; of course, certain individuals might be more aware than others of some of these processes, but, definitely, no one has reached omniscience of one's physical self (let alone of one's full self)

• a country can not completely observe all of its individuals..

By now, you will have probably realized I use the word "observation" with the meaning of: "being conscious of", "being aware of", "sensing", "measuring", "perceiving". As you will continue to read this book, you will begin to mentally connect the concepts of:

- Consciousness
- Perception
- Observation
- Measurement
- Gravitation / Electromagnetic Force

As you will possibly begin to realize they are all expressions / projections of the same phenomenon.

Note that the very fact that we don't know everything, including about ourselves, proves, in my eyes, beyond doubt, that the universe as a whole (including any arbitrarily defined portions of it that I may exist in) does not and can not observe everything. This could be formulated as: If $E_A(A) > 0$ and $A \subset B$, $A \subset C$ then $E_B(C) > 0$, $\forall A$, B, $C \in P(U)$. An interesting consequence of this might be that our lives, as we experience them in a localized region of the universe, are not predetermined.

However, this book proposes that the universe is, in fact, infinitely predetermined in a mathematical way, by laying out an endless space of possibilities that are at our disposal. I guess one could say that if the universe predetermined an infinity of possibilities to choose from, the universe "conspired" to offer a wide set of options, but the sheer infinity of them allows our human perception the experience of the free will construct. Throughout the book, I will attempt to model what I refer to here as an infinitely predetermined (mathematical) universe just as I will also attempt to clarify the concept of human constructs (i.e. largely three or four-dimensional in nature, such as time, space, free will).

To say that we experience something as a construct does not make it less real. It's not the purpose of this book to make you think (nor do I personally believe) that the universe is a Matrix-like simulation created by some higher power / force for some arbitrary purpose. What I mean by "construct" is the conceptualization of relatively limited experiences without taking into consideration the bigger picture and the patterns that might more accurately describe those experiences. For example, have you ever been in a car and looked at another car's spinning wheels? Depending on the speed, you might sometimes have the impression that the wheels are spinning in a direction opposite to that of the car. But you know the direction in which the car is moving, so you understand the difference between a localized perception and the bigger picture.

Entropy in the Venn diagram of constructs

In this chapter I introduced a formal expression for entropy and I also used the notion of observation in association with the omni-presence of consciousness. It would also be fitting to enrich the concept model accordingly (entropy / uncertainty would have, strictly speaking, no intersection with observation / measurement / certainty).



Venn diagram of constructs (version 3): +Entropy (Uncertainty)

Chapter 5

Axiom 1: Concurrent Observation

A phenomenon under concurrent¹⁸ observation can not become more uncertain than it is under sparse¹⁹ observation.

Formal expression

Considering the already defined function E_{x} , the axiom states that

 $E_{A \cup B}(x) \le \min(E_A(x), E_B(x)), \ \forall A, B, x \in P(U)$

Example

The double slit experiment provides one of the simplest frameworks to demonstrate this specific axiom. Without going into the details²⁰ of this experiment (which basically showcases particle-wave duality), we can simply analyse the behaviour of electrons which pass through a double slit and compare:

• entropy without a detector, $E_{DS}(x)$

¹⁸ Under observation by multiple observers

¹⁹ Under observation by few (even one or no) observers

²⁰ The double slit experiment consists of launching minuscule particles (such as electrons) towards a single slit and then towards a double slit. In the first case, an apparently slit-shaped projection is formed on the screen behind the slit (showing how particle and wave behaviour can be similar); in the second case, instead of a double slit projection, the screen shows an interference pattern - within this context, electrons behave like a wave. Adding an electron detector to one of the slits will cause electrons to behave like particles again. This experiment is a great example of both particle-wave duality and the observer effect.

• entropy with a detector, $E_{DSUDET}(x)$

where DS and DET represent the double slit and the detector as observers which ultimately observe electron x at the same time.

The experiment clearly shows that the uncertainty / entropy of the electron when a detector is attached becomes smaller (as it collapses enough to satisfy measurement coming from two sources now: both double slit and detector): $E_{DSUDET}(x) < E_{DS}(x)$

Axiom 1 fits within the inequality above: $E_{DS \cup DET}(x) \le min(E_{DS}(x), E_{DET}(x)) < E_{DS}(x)$

The double slit experiment, however, is usually implemented with detectors capable to quite accurately locate the electron (i.e. the detector is usually a much better observer than the double slit itself): $E_{DET}(x) >> E_{DS}(x)$ which tends to distract the viewer from the additivity of the two concurrent observations (via double slit and detector at the same time), as most often the fact that the electron has collapsed into a particle is the (only) result of note²¹.

In our diagram of constructs, particle-wave duality would be the possibility of fluctuation between generic uncertainty (lower degrees of consciousness) and generic certainty (higher degrees of consciousness).

[Diagram is on the next page]

²¹ The general (and perhaps limited) perception is that matter can either be a particle or a wave, when in fact the notions of particle and wave are human constructs and relative. What one might perceive as a particle, another might perceive as wave that is collapsed to high degree but could possibly collapse even further.



Venn diagram of constructs (version 4): +Particle-Wave Duality

Chapter 6

Theorem 1: Perceptually-Limited Observers

No observer will ever be able to perceive, infer and mathematically model all phenomena in existence.

Hypothesis

There does not exist an $x \in P(U)$ such that $E_{x}(U) = 0$

Proof (by contradiction)

- 1. Let's assume there exists an $x \in P(U)$ such that $E_{x}(U) = 0$
- 2. According to Conjecture 1 (of *Reflexive Uncertainty*), $0 < E_{U}(U)$
- 3. According to Axiom 1 (of Concurrent Observation), $E_U(U) \le \min(E_x(U), E_{U-x}(U)) \Rightarrow$ $E_U(U) \le \min(0, E_{U-x}(U)) \Rightarrow E_U(U) \le 0$
- 4. From 2. and 3. $\Rightarrow 0 < E_{II}(U) \leq 0$ which can not be true.

I formulate this theorem based on the premise described in the first chapter. The theorem suggests that as long as we try to create mathematical models of the universe (including its origin) based on the *observable and measurable material world*, the maximum relevance of such models will be the *observable and measurable material world*. While *this* concept is still of enormous size and relevance, it is still limited by the amount of space-time that we can perceive (and possibly



by other known and unknown factors as well). Therefore we can use this theorem in an attempt to generalize the problem of modelling the universe. The theorem implies that the universe, along with its full set of phenomena, is too complex to capture in a complete mathematical / physical model. This is more than a statement, it's a cornerstone that gives us the foundation to move from a bottom-up process to a top-down process of building a unified theory / model. While the currently mainstream (cca. 2018) bottom-up scientific process is based on observation, modelling, discovery, inference, computation of phenomena (effects, forces, mechanics, behaviours, particular states of matter, micro & macro-cosmos, etc.) the top-down process can perhaps be more efficient by starting at the already integrated point of origin.

The proposal I make by means of this book will use the mentioned top-down process by attempting to define the origin of the universe and by consequence its evolution. Once the evolution and origin of the system are established we can perhaps gain insight into particular states of this system and how phenomena within it come to existence.

Although the purpose of this book is not necessarily to look at the universe from a systems theory perspective, we will see the IPO (Input-Process-Output) pattern emerge from the top-down representation of the universe that is based on this conjecture.
Chapter 7

Theorem 2:

Probabilistic Nature Of The Universe

- 1. The basic nature of the universe perceived from any perspective within the universe²² guarantees particle←wave duality²³
- 2. The nature of the universe is probabilistic²⁴ and superpositional at best, perpetually unknown at worst.

Hypothesis

To assume the universe has an origin implies the universe is a state machine since it evolved from that origin. Since it evolved from that origin it also implies there are functions that model this evolution. Let $s_{m,n}$ be these functions of evolution such that $s_{m,n}: U_m \to U_n$ with $n, m \in N^*$ and U_m, U_n being universal states in a cause-and-effect relation. Let us then define the nature of the universe as a function *Nat* that returns the set of all tuples consisting of a prior universal state and its function of evolution:

Nat:
$$U_n \to \{(U_m, s_{m,n})\}$$
 and $Nat(U_n) = \{(U_m, s_{m,n}) \mid s_{m,n}(U_m) = U_n\}$

²² Observable and unobservable

 ²³ I describe my notation for directional particle-wave duality later in this chapter
 ²⁴ In a sense, I state that (at best) we live in a "quantum" universe as described in quantum physics.



The theorem states that we can mathematically deduce no definitive information on the behavior of $s_{m,n}$ and *Nat* and that, at most, we can make probabilistic assumptions about $s_{m,n}$ and *Nat*.

\sim

Proof

We take for granted, as stated in the hypothesis, that the current (state of the) universe U_n has an origin (i.e. an original state) U_0 . Therefore there must exist a function $s_{0,n}$ such that $s_{0,n}(U_0) = U_n$

Let $n = 1 \Rightarrow Nat$ has only one element in the first post-origin universal state: $Nat(U_1) = \{(U_0, s_{0,1})\}$. We could call $Nat(U_1)$ the basic nature of the universe and $s_{0,1}$ the basic function of evolution. At this point, we can make no further deductions because no additional behaviour has been modeled outside that of a generic state machine. However, if $s_{0,1}$ exists, it can only exist within $U_0 \Rightarrow$ the universe and its function of evolution of evolution of evolution of particle—wave duality²⁵.

Notation for the direction of likelihood of collapse²⁶

I used an arrow to describe a direction for the likelihood of collapse (i.e. the state machine analogy only guarantees that waves are collapsable). As you will notice in the following chapters I will describe the universe as an ordered space which, among other properties, exhibits two "edges", one with a maximum probability for wave collapse (particle—wave) - closer to the initial, original state of the universe - and another one with a maximum probability for collapsed particles to revert to waves (particle—wave) - at this edge collapsed particles are unstable and

 $^{^{25}}$ I will also conject, as will be seen, that the universe exhibits particle \rightarrow wave duality as well; the consequence of this conjecture is that the universe, as a whole, exhibits particle \leftrightarrow wave duality.

²⁶ As quantum mechanics describes: *"wave function collapse is said to occur when a wave function—initially in a superposition of several eigenstates—appears to reduce to a single eigenstate (by 'observation')"* (Wikipedia). Much more can and probably should be said about collapse; in case the reader is not familiar with this notion, a simplistic definition is better than nothing. However, please refer to Conjecture 1 (Reflexive Uncertainty) for one such nuance which I try to make, that would reduce / debunk the almost mythological / implicit "binary" aspect of matter (either wave or particle) and would replace it with an explicitly relative view of particle-wave behaviour which seems to be more realistic.

almost immediately revert to waves. The space between these 2 edges is ordered, continuous and relative to the edges (we reside in a stable, balanced region of this infinite space). I will graphically model this concept in the next chapters.

Furthermore, let's consider the case of $n = 0 \Rightarrow Nat(U_0) = \{(U_0, s_{0,0})\}$ To assume $s_{m,n}$ is always defined, even for m = 0, n = 0, is to assume there will always be a function, within each and every state of the universe, which allows an initial universe to co-exist with subsequent universes. This allows for *superposition* (which I would call the *persistent nature of the universe*).

I will attempt, based on this theorem, to create the best possible mathematical model for the nature of the universe within the restrictions that, as conjectured (*Reflexive Uncertainty*), it will in all certainty be incomplete. However, completeness is not the purpose of this mathematical model. As opposed to traditional mathematical models, the objective will be to allow the formal inclusion of phenomena as perceived by our localized perspective (physical, chemical, astronomical phenomena). The exact expression of these mathematical functions will be secondary and perhaps impossible with the means I have at my disposal: the primary goal is, however, to mathematically prove that there exist such functions within the proposed model, therefore validating it as a unified theory.

Additional note regarding the mathematical model

The validity / possibility of a unified mathematical model is supported by the universe being permeated with structure across all regions of visible space from micro to macro-cosmos; furthermore, this structure doesn't seem to be varied or to occupy a certain range of patterns, but one pattern in particular emerges massively, the orbital pattern: electrons orbit nuclei to form atoms, planets orbit stars to form star systems, star systems orbit black holes to form galaxies...

Interpretation of the probabilistic nature

Perhaps a good way to look at the basic nature of the universe is the Shakespearean question²⁷: "To be or not to be?" (i.e. "To collapse or not to collapse?"). The universe is a superposition of the two possibilities (equal in probability, on the grand scale, for reasons I will describe in the next chapters) and their subsequent development, which I will call the tree of probabilities. It must be noted that there appears to be a bias for the question to appear after the content of the answer is already in existence. I should rephrase this so it's more likely that you understand (because this idea is essential²⁸ to my theory of a probabilistic universe). The unknown was unknown even before someone could formulate a question about it. In the context of superposition (which is given), the unknown actually becomes uncertain, which, until observed otherwise, generates every possibility between certainty and uncertainty, each with a certain probability, thus triggering a chain reaction that creates the universe. But I say "creates", not "created", because, in the basic realm of possibility, time doesn't exist. Time is merely an illusion, as you have undoubtedly seen in some quotes shared by your "esoteric" friend on Facebook, but unlike your esoteric Facebook friend, I will actually show you why.

²⁷ See Appendix 1 for more "Shakespeare analogy"

²⁸ The concept of answer preceding question will be revisited in future chapters. There are many things at play such as quantum physics and the observer effect, but the reader must understand the nuance that it's not necessarily the answer itself (measured result) that precedes the question (measurement), but it's the space of solutions (nature and informational content / range) that has a bias for already being in place before the question is asked.



Part 3

The probabilistic representation of the universe

in which I expand upon Theorem 2, create a mathematical model for the universe and attempt to map material and abstract concepts, such as physical laws, onto this model

Chapter 8

The Probabilistic Representation Of The Universe

Question: What *was* there in the beginning? Answer: **I don't know.**

100% uncertainty (U₀)



Question: Uncertainty about what?

Answer: About what there *was*... If we begin from maximum uncertainty there must be change involved. If there would not be a possibility of change, uncertainty wouldn't be uncertainty (and we would not be here): **"Will there be a change?"**



Question: But...

Answer: I think you're starting to see the picture, but there might still be **some uncertainty left?**



And so on towards infinity, where:

 U_n contains $\frac{1}{2^n}$ parts (or $\frac{100}{2^n}$ percent) uncertainty, as a left-hand leaf. The collapse is simultaneous (it all happens at once) and perpetual (it has been, is and will be continuously happening - as I will detail throughout the book, time is a construct that occurs when $n \rightarrow \infty$). Also note that in this representation universes coexist:

 $U_0 \subset U_1 \subset \dots \subset U_n$

and are superpositional: one can not say that a certain amount of uncertainty *has* collapsed, but one can quantify the probability that a certain amount²⁹ of uncertainty collapses; therefore this tree of probabilities describes a singularity of uncertainty gradually and probably (but not definitely!) collapsing towards infinity and an infinite number of universes that coexist. Making the distinction that uncertainty is probably but not definitely collapsing is extremely important to understanding the mechanism. By establishing that the universe begins in complete uncertainty we have defined both the state machine³⁰ and its initial state. The algorithm derives from uncertainty itself: 100% uncertainty would not be 100% uncertainty if it did not allow for a state change, otherwise it would be 100% certainty! So the original state of the universe found the middle way between 100% uncertainty (0% certainty) and (100% certainty) which is:

- half of the uncertain origin collapses (into a state);
- the other half which remains uncertain continues the same process.

One might ask: "Why half?". When the solution space is binary / boolean and infinitely random, both solutions will have equal odds of being produced³¹³². For the purpose of better understanding, here is the same probabilistic representation with more focus on the tree itself and its propagation towards infinity:

²⁹An amount of uncertainty represents, in fact, a probability

³⁰ The universe is possibly the greediest state engine algorithm in existence

³¹ This is true when modelling the universe as a binary tree. It doesn't need to be a binary tree - there is another, equivalent way: as a tree where each uncertainty node has an infinity of children. While the latter is probably closer to the actual nature of the universe, the binary tree is closer to the human perception of quantum behaviour: superposition vs. collapse

³² Only read this footnote if you've already read the book at least once: One difference between the binary tree and the regular tree which forces each uncertainty node to have an infinity of children is the shape of the representation of the subjective universe. In the latter, the shape is concave (within the flat 2-dimensional representation of the tree).



(in diagrams I will represent infinity³³ as the smallest infinite ordinal ω)

If, at this point, you're asking yourself: "if uncertainty always collapses, shouldn't have uncertainty been eliminated from the universe as $n \rightarrow \infty$?", please note that uncertainty does not always collapse since that would result in a paradox: if uncertainty always collapses, it's not uncertainty. You should replace, in your mental model, the statement "uncertainty always collapses" with "uncertainty has a probability to collapse".

But perhaps one of your biggest questions is: "Where did our solid surroundings come from if the universe is composed of mere probabilities?". I will try to explain space and time constructs in the following chapters.

The probabilistic representation already offers a basic, perhaps irreducible definition of consciousness / perception: As uncertainty collapses it becomes stateful, through infinite complexity. What was

³³ See hyperreal numbers and the recommendations of chapter 2

once uncertain is now perceived / measured. Consciousness is a high-level, emergent property of perception (collapse). As to how consciousness can arise from a seemingly simple, abstract collapse of uncertainty: collapse is not a discrete process, but a continuous one.

Let us consider the collapse of U_0 with probability $\frac{1}{2}$.

If we would sum up the remaining probabilities of collapse, we would obtain: $\sum_{i=2}^{\infty} \frac{1}{2^i}$ which can be treated as the sum of a geometric sequence $S_n = \frac{a_1(1-r^n)}{1-r}$. In our case a_1 is $\frac{1}{4}$ and r is $\frac{1}{2}$ so $\sum_{i=2}^{\infty} \frac{1}{2^i} = \frac{1}{\frac{1}{2}} = \frac{1}{2}$. In fact $\sum_{i=k}^{\infty} \frac{1}{2^i} = \frac{1}{2^{k-1}} \Rightarrow$ The probability of any collapse ulterior to a collapse with

probability $\frac{1}{2^k}$ is $\frac{1}{2^k}$. A graphical interpretation of this equality indicates:

The (right-hand) transition from uncertainty to a collapsed state, in the space defined by $U_k - U_{k-1}$, can be precisely described by the (left hand) probabilistic subtree of ulterior collapse, in the space defined by $(\bigcup_{i=k}^{\infty} U_i) - U_{k-1}$

I will refer to the statement above as the *consciousness identity*.

Therefore, if one of the arguments for consciousness is complexity, the patterns that emerge from the probabilistic representation support such complexity within its simplest operations. As described by the *consciousness identity*, the decomposition of any (right-hand) collapse can be associated with the act of perception / measurement / asking a question and the (left-hand) infinite subtree can be associated with the perceived / measured / answer. (Right-hand) Collapse and (left-hand) propagation of uncertainty reveal themselves to be one and the same thing, since the propagation of uncertainty leads to an overall collapse of subtree towards infinity.

By now you will have probably deduced that, within this paradigm, universes are subtrees in the probabilistic tree with root U_0 , U_0 being the universal origin of complete uncertainty. This deduction coupled with the *consciousness identity* leads to the natural conclusion that the function of

evolution³⁴ from a universe³⁵ U_n to universe U_{n+1} can be expressed as a function of the (left-hand) subtree of U_n since the (right-hand) collapse of U_n can be expressed as the (left-hand) subtree:

$$\exists f: s_{n,n+1} = f\left(\left(\bigcup_{i=n+1}^{\infty} U_i\right) - U_n\right)$$

For future reference, I will call this the *Perpetuum Mobile Identity*. (i.e. the universe is basically a device³⁶ which triggers the evaluation of its subsequent states recursively).

³⁴ The function of evolution as defined in Theorem 2 (Probabilistic Nature Of The Universe)

³⁵ In other words, universal state (as in: state within the state machine)

³⁶ A *deus-ex machina* even - in this acceptation the universe (unexpectedly) solved everything

Chapter 9

Conjecture 2:

Fractal Nature Of The Universe

The universe is a fractal.

Formal expression

Let us consider the Perpetuum Mobile Identity:

 $\exists f: s_{n,n+1} = f\left(\left(\bigcup_{i=n+1}^{\infty} U_i\right) - U_n\right)$

 \sim

I conject that universes themselves are functions, as well as states, and that f is the identity function, leading to:

$$s_{n,n+1} = (\bigcup_{i=n+1}^{n} U_i) - U_n \Leftrightarrow \text{fractal self-similarity on all scales}^{37}$$

Corollary 1

The next state of a universe is a function of all subsequent states.

$$s_{n,n+1}(U_n) = U_{n+1} \Leftrightarrow ((\bigcup_{i=n+1} U_i) - U_n)(U_n) = U_{n+1}$$

 \sim

The arguments of this function as well as the function itself (meaning all subsequent states to infinity) are being evaluated before the next state

³⁷ "A fractal is an object or quantity that exhibits self-similarity on all scales" (WolframAlpha)

can be calculated. This means the universe(s) recursively sprang into existence in its (their) entirety, all at once³⁸ and that the notion of universal state is not bound to time or space - any universal state has existed, exists and will exist:

$$U_n \subset U_{n+1} \supset \left(\bigcup_{i=n+1}^{\infty} U_i\right) - U_n$$

Interpretation

The graphical interpretation proverbially reveals the circle is now complete.

The universe is its own answer and the universe formulates its own question, in this order. You might wonder how can an answer come

³⁸ Remember, we haven't defined the concepts of space and time yet

before a question - in a way, it's the same as the measurement of an object.

Even if person P measures the length of an object O and writes down a number, the reality of object O having that length was in place even before the measurement³⁹. The universe created its own question(s) and answered at the same time; the first question came in U_1 but the uncertainty that would generate both question and answer comes from U_0

. Another way to look at it is through the definition of entropy in Conjecture 1 (of *Reflexive Uncertainty*): $E_{\phi}(U_0) = 1$. In other words, when the universe began, there was maximum entropy / uncertainty and no observer (hence $r = \phi$), but, very importantly, observer nonexistence did not cancel⁴⁰ the reality of maximum entropy at U_0 .

Further ontological⁴¹ **remarks**

The findings above seem to suggest that the (reality of the) answer attempts to generate the question, but before actually formulating the question it makes sure the space of solutions is readily available. This may seem hard to wrap our heads around; as a simplistic example, let's ask ourselves: "Where do we come from?". But to ask this question, we have to have come from somewhere in the first place.

The *consciousness identity* (on which Conjecture 2 is based) reveals that the path from uncertainty to the question is the reality contained within the answer. However, instinctively, we would say: the path from uncertainty to knowledge is the answer. This is also correct, it just depends on the direction of your perspective. We are geared towards seeking certainty. We ask questions and measure things, thus, looking to "collapse" whatever bits of uncertainty surround us. One could say we

³⁹ Of course, things can be a bit more relative at the intersection between quantum physics and the observer effect, but this was just a simple example to explain the idea that the reality / truth of the solution space of an answer can precede the question. ⁴⁰ On the contrary, lack of observation is proportional to uncertainty / entropy

⁴¹ Ontology is a branch of metaphysics that studies the nature of being, existence and

reality

are expressions of a force of certainty. Some might refer to it as the omniscient God. Some others might call it The One (as in "We are One"). I, of course, asked myself whether I could localize The One in the probabilistic tree and my first impulse was to consider that The One is the ultimate observer, created by the first collapse (modelled in U_1). To accurately model the (right-hand) collapse of U_0 with set theory might be a bit of a stretch:

$$ONE = U_1 - U_0 - ((\bigcup_{i=2}^{\infty} U_i))$$

But from Conjecture 2:

$$U_{n+1} \supset \left(\bigcup_{i=n+1}^{\infty} U_i\right) - U_n \Rightarrow U_0 \supset \left(\bigcup_{i=0}^{\infty} U_i\right) - \emptyset$$

So
$$U_0 \supset U_1 \Rightarrow U_1 - U_0 = \emptyset \Rightarrow ONE = \emptyset$$

Before you rush to the conclusion that I try to prove God (or The One) doesn't exist, it would be more accurate to say that I could not find a specific probability for the existence of God as a separate entity. The probabilistic representation, as I build it up, will not concern itself with this issue. On a final note, we can definitely say there is an undeniable force that collapses uncertainty. However, omniscience aside, since $E_{\phi}(U_0) = 1$, this force of collapse is driven by U_0 itself, which is a singularity of maximum uncertainty \Rightarrow I think it's also safe to conclude there is no all-powerful being (i.e. not even the first collapse of probability $\frac{1}{2}$ can change the fundamental behaviour of the state machine - in fact, the first collapse is faced with the greatest amount of uncertainty to be measured).

The universe does, however, show a remarkable bias towards (co)creation and information. While the only chance for the universe was

to spring itself into existence from maximum uncertainty, the fact that maximum uncertainty has led to someone writing this book and someone else reading it is amazing. Perhaps God / The One are (only some of the) conceptualizations humanity has used to try to express this bias^{42 43}.

While we are actors in this never-ending game of certainty vs. uncertainty, perhaps some of the most relevant meanings of life might be, probabilistically speaking, to increase the space of possibilities and to ask as many questions as possible.

 $^{^{42}}$ This bias is not subjective, but objective in essence, as the probabilistic tree reveals starting from U₀. The fact that this bias exists and is mathematically provable is reason for further amazement.

⁴³ The fact that they might be conceptualizations does not take away from their underlying value. An entity/object might be conceptualized in different ways, yet its underlying nature and reality can be the same regardless of the concept shape.

Chapter 10

The Mathematical Emergence Of Consciousness

and of subsequent constructs...

Let us reconsider⁴⁴ the "first" collapse (belonging to the universal state U_1) that occurs with probability $\frac{1}{2}$.

The consequence that the U_0 wave collapses (with probability $\frac{1}{2}$) into a state is both necessary and sufficient:

⁴⁴ It was first considered in chapter 8 (*The Probabilistic Representation Of The Universe*)

- necessary⁴⁵ for the bias of uncertainty to collapse with a certain probability (perpetually triggering the execution of the (fractal) state machine) this would be what we can associate to will⁴⁶;
- sufficient for the emergence of state persistence what we associate to consciousness.

Consciousness is determined by state persistence in the same way a memory bit can describe its own state / value. Therefore the right descendent of any probabilistic vertice⁴⁷ will be conscious of its state. The direct left descendent of a probabilistic vertice can not be conscious, as a ("remaining") quantity of uncertainty (which will collapse further, however, forming its own subtree).

In the already mentioned example of the "first" collapse, we can call the resulting consciousness C_1 . Will is the vector $\overline{U_0C_1}$ and, also considering the consciousness identity in chapter 8, C_1 would be a function⁴⁸ of the transition to its current state (i.e. the left (infinite) subtree of U_0) and its probability $\frac{1}{2}$:

$$C_1 = f((\bigcup_{i=2}^{\infty} U_i) - U_1, \frac{1}{2})$$

⁴⁵ If a quantity of uncertainty would not have a probability to collapse, it would not be uncertainty

⁴⁶ What John H. Conway and Simon B. Kochen call (free) will - see chapter 2

⁴⁷ Vertice in the tree of probabilities

⁴⁸ Not just any function, but will itself

One could also consider will itself to be a function $w: P(U) \rightarrow P(C)$ such that $C_1 = w(U_0)$

Generalized quantification of consciousness

 $C_k = f((\bigcup_{i=k+1}^{\infty} U_i) - U_k, \frac{1}{2^k}) = w(U_{k-1})$

where f might be a traversal algorithm that adds probabilities of collapse.

Explanation

Consider the fractal schema from chapter 9:

A simple geometric interpretation reveals that, for the fractal nature to work, the probability of C_n coming into existence has to be equal to the

total probability of all subsequent collapses C_k where k > n. This has already been proven while explaining *the consciousness identity* in chapter 9; therefore, for the sake of the reader, I will consider it obvious that $\frac{1}{2^{n+1}} + \frac{1}{2^{n+2}} + \dots = \frac{1}{2^n}$. This context might suggest that f is a form of additivity / synchronization⁴⁹ (S) that is also relative to a third party, namely an observer - i.e. some observers might perceive two or more entities to be highly in sync while others might perceive them in low synchronization (desynchronization). This hypothesis will be explored in the following pages.

The hypothesis⁵⁰ of relative synchronization

A relative form of synchronization would then take two parameters:

- an n-tuple of entities subject to measurement of sync;
- the observer.

All of them are part of P(U), the powerset of the entire universe, including all of its universal states, therefore, for simplicity, $S: P(U)^n \times P(U) \rightarrow [0, 1]$

Collective consciousness considering sync relativity

In chapter 3, collective consciousness has been expressed as:

$$C(\sum_{i=1}^{n} E_{i}) = S(E_{1}, E_{2}, ..., E_{n}) \times \sum_{i=1}^{n} C(E_{i})$$

But, if synchronization is now relative, consciousness must also be so - the notation *C*will be used flexibly:

- One or two parameters when *C* is used as a function to evaluate the consciousness of an entity i.e. *C*(*entities*, *observer*)
- Index when C is an actual conscious / collapsed entity i.e. $C_{\mu} \in U_{\mu}$

⁴⁹ See chapter 3 on *Ubiquitous Consciousness* for a discussion around *S* (synchronization)

⁵⁰ While the hypothesis of relativity is likely, relativity of synchronization itself will be considered a weak hypothesis compared to the relativity of consciousness, as shown in the following pages.

To represent relative collective consciousness we use the 2-parameter function(s):

$$C(\sum_{i=1}^{n} E_{i}, o) = S((E_{1}, E_{2}, ..., E_{n}), o) \times \sum_{i=1}^{n} C(E_{i}, o)$$

where $o \in P(U)$ is an observer.

Quantification of consciousness considering sync relativity

$$C_{k} = S((\bigcup_{i=k+1}^{\infty} U_{i}) - U_{k}, C_{k}) \times \sum_{i=k+1}^{\infty} C_{i}$$

A consequence of this expression is $S((\bigcup_{i=k+1}^{\infty} U_i) - U_k, C_k) = 1$ (an outstanding definition for synchronization / additivity) because we already know $\sum_{i=k+1}^{\infty} C_i = C_k$.

However, intuitively, every consciousness is associated⁵¹ to its maximum quantity of perception, so a formula for relative consciousness might be: $C(E, o) = \frac{C(E)}{C(o)}$

Mathematics of question and answer

We have put will in the probabilistic representation and claimed it can be either a function or a vector. What would then w^{-1} or $-\overline{w}$ be?

⁵¹ And not just "is associated" but rather "is". Consciousness is perception / measurement / experience.

It's only logical that $-\overline{w} = \overline{C_k U_{k-1}} = \overline{q}$ is the question because the collapsing uncertainty (i.e. consciousness) will continuously⁵² ask its source (largely put: the universe) towards which state it should move. To continue the memory bit analogy: this would be a quantum bit and, even if its collapsed state is in existence, it's also reading the state-to-be from the data source. In other words, the bit (consciousness) is both filled up and filling itself up with data. The answer is exactly the left (infinite) probabilistic subtree that derives from its source:

Comparison between will and question:

- assuming the state value is provided, the state change itself must still be triggered this is the bias we have called *will*;
- assuming the state change is triggered (will), the state must be filled out informationally this is the reverse action which we have called *question*.

Both exist in superposition.

⁵² Continuously because of persistence (also see n=0 in Theorem 2) and superposition

Therefore we can say that the universe is perpetually answering its own question (asked by C_1) but the answers themselves contain additional questions, which are also perpetually answered, thus generating the infinite universe with all of its possibilities (including space-time in its entirety). Every place and moment that we know - including much, much more - is readily generated. This doesn't contradict free will as the possibilities are still at our disposal - the nuance is: for the possibilities to be at our disposal they must be, and they are, indeed, pre-generated.

Synchronization and its likely nature

Questions are additive (i.e. subject to synchronization) because, in essence, the uncertainties that generate the answers are additive as well. Due to conservation of entropy and order⁵³ and the fact that the total quantity of entropy and order in the universe can not increase, this additivity manifests itself as synchronization. More practical effects of synchronization will be explored in the next chapter, but a simple, generic example can be given here:

We now revisit the relative sync hypothesis; this example is one of perfect synchronization because probabilities discussed up to this point are of the form $\frac{1}{2^n}$ but a generic formula would be, for example:

$$S(E_1, E_2) = 2 \left| \left\{ \frac{\max(C(E_1), C(E_2))}{\min(C(E_1), C(E_2))} \right\} - \frac{1}{2} \right|$$

⁵³ See Theorem 3: Conservation Of Entropy in the Appendix

The further the ratio is from an integer, the less synchronized the given entities are. A formula for relative synchronization might not be that obvious but it can be reverse engineered from *collective consciousness considering sync relativity*:

$$C(\sum_{i=1}^{n} E_{i}, o) = S((E_{1}, E_{2}, ..., E_{n}), o) \times \sum_{i=1}^{n} C(E_{i}, o) \Rightarrow$$

$$S((E_{1}, E_{2}, ..., E_{n}), o) = \frac{C(\sum_{i=1}^{n} E_{i}, o)}{\sum_{i=1}^{n} C(E_{i}, o)} \Rightarrow S((E_{1}, E_{2}), o) = \frac{C(E_{1} + E_{2}, o)}{C(E_{1}, o) + C(E_{2}, o)} =$$

$$= \frac{\frac{C(E_{1} + E_{2})}{C(O)}}{\frac{C(E_{1})}{C(O)} + \frac{C(E_{2})}{C(O)}} = \frac{C(E_{1} + E_{2})}{C(E_{1}) + C(E_{2})} = S(E_{1}, E_{2}) \Rightarrow$$

 \Rightarrow a contradiction of the relative sync hypothesis! This shows that the assumption of relative consciousness is stronger than the relative synchronization hypothesis. Therefore, although it will not be wrong to use a second argument for *S*, it will simply be considered superfluous from now on as I surmise I have just shown that there is a high probability that:

- consciousness might be relative to the observer;
- but synchronization is absolute.

Relative Collective Consciousness

Considering this result, collective consciousness can be optimally expressed as:

$$C(\sum_{i=1}^{n} E_{i}, o) = S(E_{1}, E_{2}, ..., E_{n}) \times \sum_{i=1}^{n} C(E_{i}, o)$$

Chapter 11

Recurring Spatial Patterns

So far we didn't explain where space and time actually reside in the probabilistic model. There are several reasons to first consider space for analysis, including the perception of certain spatial patterns, i.e. multiple instances of the same three-dimensional structures: electrons, protons, atoms, molecules, etc. We even generically observe sufficiently similar instances of more complex entities: trees, animals, persons, planets, stars, galaxies. (Our) three-dimensional space is imbued with patterns - and even multiple instances of the same pattern - that apparently manifest themselves endlessly.

Question 1 - Recurrence

Up to the probability of $\frac{1}{\omega}$, at least, we don't see any kind of pattern or recurrence in the tree of probabilities. How should we then have multiple protons or multiple electrons in the universe if we can't even localize multiple instances of any pattern in our probabilistic model, let alone elementary particles?

As I tried to answer Question 1 and I saw that I couldn't, I deduced that there must be an additional quantity which varies across the tree of probabilities. Such a variance would possibly allow recurrences in the tree (e.g. the same probability of collapse occurring in two different places within the tree). I also realized that working inside a top-down model, I didn't have to define universal behaviour at infinity yet, so this became my next question.

Question 2 - Universal behaviour "at infinity"

How does U_n behave when $n \to \infty$? Clearly C_{n+1} , which collapses from U_n , tends to 0 as $C_{n+1} = 2^{-(n+1)} \to 0$ when $n \to \infty$.

However, a geometric interpretation reminds us that

 $p = C_{n+1} = 2 \times C_{n+2}$

Since $C_{n+2} = 0 \Rightarrow C_{n+1} = 2 \times 0 = 0$. From this, I produce three lemmas:

Lemma 1

There must be a bridging behaviour (of the probabilistic tree) that describes the transition from finite behaviour to infinite behavior.

Lemma 2

Since, at the limit, both certainty and uncertainty will have a probability of zero, they are now (albeit null) in a superposition (albeit of impossible events).

Therefore, the universe is gradually drifting back towards superposition at its infinite limit.

Lemma 3

Since U_n is no longer a superposition of states at the infinite edge of the universe, U_n is collapsed. Therefore, concomitantly with a bias towards superposition (Lemma 2), a bias towards collapse is also expressed.

If a bias towards collapse must be compatible with a bias towards superposition, it can only mean collapse is drifting into superposition. I will call this *weak collapse* since it begins to exhibit a probability of decaying back into a wave function. A model for weak collapse would have to begin in a probabilistic region that transitions from no bias toward superposition (*strong collapse*) to infinitesimal (but ever increasing) collapse weakness. Any such region can only be represented using an infinite ordinal - we can't really say it begins from a fixed U_n

with *n* finite. Which infinite ordinal we choose for modelling doesn't make any difference; for convenience, I choose the first one $\frac{1}{\omega} = \varepsilon$, with the nuance that I choose it as a starting probability of collapse, so instead of U_{ω} I will represent the evolution of $U_{log_2\omega}$. Effectively, I will zoom in on the highlighted subtree:

For the record, the highlighted subtree has its root in $U_{log_2\omega-1}$. Before we can actually represent it, we need to find models for the increase of collapse weakness and for the bias towards superposition from infinitesimal values on. Again, the order of magnitude associated with the two biases doesn't matter, as long as their order of magnitude is smaller than the order of magnitude for collapse probabilities themselves since the bias towards collapse (Lemma 3) expresses itself through addition and the bias towards superposition (Lemma 2) expresses itself through subtraction. Since the probabilities that we are working on are on the order of magnitude ε , I will choose a power of ε (e.g. ε^2) as the beginning of a mounting infinitesimal bias. For simplicity, I will also

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choose a linear function to model the growth of ε (for both biases) in sequence with universal states - any increasing function will do⁵⁴. Following is a generic state diagram showing the behaviour of σ_n ,

growth function of both biases - the same growth function has been used for both biases as a result of Theorem 3 (*Conservation Of Entropy*⁵⁵).

Note: Also as a result of (overall) conservation of entropy and order, the low-probability decay of an already biased collapse is not biased as well, please see the mathematical proof in Theorem 3.

There is now enough information to model the states around $U_{log_2\omega}$; as mentioned above, for exemplification⁵⁶ purposes only, I will choose a simplistic linear function for bias growth, $\sigma_n = n \times \epsilon^2$:

⁵⁴ Please see Appendix 6 for proof that any increasing function will do

⁵⁵ Theorem 3 is also explained in the Appendix

⁵⁶ Please see Appendix 6 for proof that any increasing function ensures recurrence

This shows not only that recurrence is possible within this probabilistic model but also that there is an infinite number of recurrence types, each of them occurring in an infinite number. This allows the existence of an infinite number of small particles as well as combinations of such particles (electrons, protons, photons, quarks, bosons, etc.) and therefore the physical, observable universe, as we know it, is possible.

Venn diagram of constructs (version 6): +Space

Particle representation

Particles, as we usually refer to them, and particle combinations are superpositions of waveforms and collapsed states and can therefore be represented as probabilistic subtrees. Before we can even attempt a generic, hypothetical example, we should define a new notation at least for the sake of uniquely identifying collapse in a recurrence-populated universe. Until now, whenever I referred to collapse / consciousness it was with a single index because in any given U_n with *n* finite there could be only one collapse: C_n . However, when working in the infinite(simal) realm, there can be multiple collapses in the same universal state. Using

the same example as above, we can mark one of the first universes which shows more than one new collapse:

A natural extension of our current notation would be to also use a superscript index: C_n^b . Then, b is the effect of the bias on the originating probability and, as expected, n is the current universal state⁵⁷.

The 2 collapses marked above would be $C_{(log_2\omega)+1}^{2\varepsilon^2}$ and $C_{(log_2\omega)+1}^{\varepsilon^2}$ or, just as well, $C_{(log_2\omega)+1}^{\sigma(1+log_2\omega)}$ and $C_{(log_2\omega)+1}^{\sigma(log_2\omega)}$.

The third collapse (of probability $\frac{\varepsilon^2}{2}$) would have the notation $C_{(log_2\omega)+2}^{\sigma(log_2\omega)}$ A collapse outside the subjective universe would be $C_k^0 = C_k$ (since b = 0).

⁵⁷ Not to be confused with the mathematical notation of combinations. In our case *C* comes from consciousness / collapse.


Perhaps now would be a good time for a grounded, generic example, one that is closer to our dense reality.



Subjective universe

For the sake of context and future reference, I will first make the distinction that the subtree which has an occurrence probability of an infinitesimal order of magnitude where the bias towards collapse and superposition begins to manifest will be considered a *subjective*⁵⁸ *universe*. In our arbitrary example, the subjective universe would be $U - U_{log,\omega}$.

Matter

Matter - or the *material* world - originates⁵⁹ in the subjective universe. The recurrence demonstrated in this chapter allows for multiple instances of the same type of particle: we observe multiple electrons, multiple photons, multiple protons (and quarks) and so on - and even multiple composite particles that occur in vast numbers, such as, for example, atoms⁶⁰ and more complex.

A sequence of recurring probabilities, in our example above, would be, in order:

 $\frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \varepsilon^2, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \frac{3\varepsilon^2}{2}, \frac{3\varepsilon^2}{4}, \frac{3\varepsilon^2}{8}, \dots; 2\varepsilon^2, \varepsilon^2, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots$

On a side note, these strands of collapse are quite clearly of the form: $\frac{\sigma(\log_2\omega+n)}{2}$, $\frac{\sigma(\log_2\omega+n)}{4}$, $\frac{\sigma(\log_2\omega+n)}{8}$, ...

Therefore, particles such as $\frac{\varepsilon^2}{2^n}$, $\frac{3\varepsilon^2}{2^n}$, $\frac{5\varepsilon^2}{2^n}$, ..., with $n \to \infty$ are infinitely entangled⁶¹ with particles of different and unique probabilities, that are not part of the recurring strands.

⁵⁸ The term *subjective* originates from the property of being *biased*

⁵⁹ Interestingly, not only matter, but the perception of matter originates in the subjective universe as well

⁶⁰ The hydrogen atom, specifically, is considered the most common element in the universe

⁶¹ Subject to synchronization / additivity. Explained further on the next page.

The complete sequence of probabilities is:

$$\varepsilon, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \frac{\varepsilon-\varepsilon^2}{2}, \varepsilon^2, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \frac{\frac{\varepsilon-\varepsilon^2}{2}-2\varepsilon^2}{2}, \frac{3\varepsilon^2}{2}, \frac{3\varepsilon^2}{4}, \frac{3\varepsilon^2}{8}, \dots; \dots$$

In essence, an infinite number of particles of infinite types seem to be entangled with several non-recurring particles, such as the ones marked above, that are extremely rare but an infinite order of magnitude greater. We can assume recurring patterns account for the ubiquitous building blocks of matter such as we know it - this is the content of the observable universe. Let us consider an elementary⁶² particle: the electron. It would be a probabilistic subtree and not just the first associated collapse but all of them in superposition as states this electron can occupy:



⁶² Supposedly elementary (cca. 2018)



Quantum entanglement is the current scientific name for synchronization as defined in the previous chapter. For example, a highly entangled electron would be an electron under detection within the double slit experiment and a less entangled electron would be one that is inside a wave that produces the interference pattern within the same experiment. On the same scale, an electron that is "orbiting" the nucleus of an atom is more entangled (with said nucleus) than a free floating electron⁶³.

Having all possible states predefined, entanglement happens via the expression of collective consciousness:

$$C(\sum_{i=1}^{n} E_{i}, o) = S(E_{1}, E_{2}, ..., E_{n}) \times \sum_{i=1}^{n} C(E_{i}, o)$$

For example, an atom is a (minuscule) collective consciousness formed, basically, by electrons and an atomic nucleus. The nucleus is a collective possibly formed by protons and neutrons. The proton itself is a collective formed by quarks (and gluons). They are even calculable - as a primitive ⁶⁴ example, we can have a look at the hydrogen atom (the simplest chemical element - a proton and an electron):

(for readability I have disregarded gluons and color assignments⁶⁵)

⁶³ The paradigm that I have already begun to describe suggests that even free floating particles are entangled with unique particles (the ones between recurring strands) spread across space. They confer position to everything. The hypothesis is: no matter how free-floating or wave-like a particle is it will still have an infinitesimal "quantity" of position that allows it to travel through space. Queue the idea of interdimensional travel that would, perhaps, have the ability to temporarily disentangle travellers from positional particles.

⁶⁴ I call it primitive because it does not account for attraction (e.g. electromagnetic force, which will be explained later

⁶⁵ Quantum chromodynamics - quantum field theory in which strong interaction is described as an interaction between quarks via gluons, both quarks and gluons being assigned a "colour"



These particles, elementary or not, are in fact the probability that they themselves exist in entanglement with a certain point in space-time and other particles that may exist around it. The questions⁶⁶ asked by these particles seem to not have to be adjacent in the probabilistic tree since consciousness is measured relative to an observer and its function seems generically applicable.

It's not the purpose of this book to calculate specific probabilities (such as *C(electron)*, *C(proton)*, *C(photon)*) precisely, also because, given that we exist in the subjective universe described by infinitesimal probabilities and, furthermore, that material elementary particles as we know them probably occur in the realm of $\frac{\sigma(log_2\omega+n)}{2^m}$ where both $m, n \to \infty$, it's probably impossible to calculate absolute values. What might be possible, however, in a practical endeavour, is to approximate relative values within this probabilistic context.

We are now at a point where we have identified recurring patterns and we must assign "spatial" value to them. But this has basically already been done by marking the non-recurring particles (outside recurring

strands) - such as $\varepsilon, \frac{\varepsilon - \varepsilon^2}{2}, \frac{\frac{\varepsilon - \varepsilon^2}{2} - 2\varepsilon^2}{2}, \dots$ in our example - which also seem to:

- have probabilities of an order of magnitude higher than recurring particles;
- be outnumbered ∞-to-1 by recurring states while still existing in an infinite number themselves.

These properties indicate that $\varepsilon_1, \frac{\varepsilon-\varepsilon^2}{2}, \frac{\frac{\varepsilon-\varepsilon^2}{2}-2\varepsilon^2}{2}, \dots$ are *candidates* to be unique spatial markers / "space particles". This would suggest that:

- every point in space is defined by such a unique particle;
- space is infinite⁶⁷;

⁶⁶ Question vectors as inverse vectors of will

⁶⁷ Which we already knew intuitively

- space is more likely to exist than the particles (and their states) that populate it;
- a particle occupying a point in space would be highly entangled with the spatial particle identifying that point in space.

Note: I used the term *candidate* to highlight that, in fact, there probably is no way to know whether these particles form the spatial field themselves or whether the spatial field is only a consequence of these particles. While this is an "intuitive observation" I believe it actually isn't central (or even mathematically necessary) to the current theory, an aspect which I will perhaps explore in a future edition.

The ordered nature of space

While this accounts for unique positions in space, it doesn't yet account for 3D space or well defined positions, i.e. one object is in position A and another one is in position B: the distance between them is measurable and controllable and not ambiguous; but our sequence of collapses is quite linear, so the natural question would be "How can three-dimensional distances emerge from a linear universe?". While the exact number of three⁶⁸ dimensions is a complicated topic (which will be tackled in the chapter on Multiple Dimensions), we can already surmise the emergence of ordered space from a linear sequence, as long as it contains recurring patterns, through the following line of reasoning: the more unlikely a combination of particles is, the more unique it will be once it occurs. This is the case with you and I as well. We are unique individuals - complex entities - and for us every moment of perception is different. We are surrounded by similarly unique individuals and diverse contexts and we have, therefore, diverse experiences at our disposal (i.e. available for entanglement). On the other hand, an electron has a far smaller range of states: it can experience free floating, attachment to an

⁶⁸ As in: why not two or four?

atom and perhaps a small range⁶⁹ of states above, below and in between these two limited options.



$$C(person P) = S(biological subsystems of P) \times \sum_{i=1}^{n} C(subsystem_{i})$$

$$C(person P) \neq C(person Q)$$
and

 $C(person P) \neq C(person Q)$ and $S(person P, person Q) < 1, \forall P \neq Q$

When we are so uncommon (and even imperfect), it's impossible to be perfectly synchronized with the world around us; therefore, we benefit from a diverse experience. However, for an electron this will not be the case. Let's assume we have two hypothetically free-floating hydrogen atoms, each with its own entangled electron: e_1 and e_2 :

$$C(e_1) = C(e_2) \Rightarrow S(e_1, e_2) = 2 \left| \left\{ \frac{C(e_1)}{C(e_2)} \right\} - \frac{1}{2} \right| = 1$$

So not only would these particles be in perfect sync but they would, in fact, amount to the same consciousness, while the position of the two electrons becomes irrelevant. In other words, the universe is playing out in front of these two identical states as if they were one state.

Taking this further, a particle doesn't know that particles are around it. If a proton is surrounded by several other protons and neutrons, it will not inherently perceive this information as such: but its state will be one that will be consistent with that of a proton surrounded by other protons and neutrons (because this state has been readily generated by the probabilistic tree). A molecule will have even more states since it is now

⁶⁹ Small range of states can be a relative term.. Even though small compared to other entities, electron states (such as the states of any comparable particle) might still exist in an infinite number.



so complex that it can interact in multiple ways (through its atomic nuclei, "dangling" electrons and field of electromagnetic force) with other molecules it might come in contact with. Therefore there is a spatial range and relativity that builds up from small particles to large particle combinations, to the point that complex manifestations such as humans benefit from (and perceive) order and relative position.

The notion of recurring spatial patterns described in this chapter will be developed towards the concept of space-time in the next chapter, as it will slowly become apparent that space is so big it contains all moments in time. Chapter 12

The Arrow Of Time

Forward-flowing / Asymmetric time⁷⁰

As we set out to model the universe as a state machine in Theorem 2, we obtained a sequence of states in superposition but time had nothing to emerge from as we were still in the objective universe, i.e. U_0 is not the beginning of time. As we move towards its lower boundaries, into the subjective universe, an infinity of spatial markers (unrepeatable probabilities) has been generated with infinite kinds of recurrence and an infinity of potential entanglements with those unique spatial markers. In other words, if we have an infinity of unique spatial points, is it not logical to assume that the entire space-time has been pre-generated? As ordered space emerges from relativity of perception⁷¹ we only need unique space-time points in the tree. The same space-time marker in the probabilistic tree doesn't have to describe 3D perception of the same position throughout time, as the consciousness that perceives it recurs at future space-time markers as well.

Let's assume a person is described at a moment t_1 by an m-tuple of particles (and the synchronization between them, but for the purpose of

⁷⁰ Reference to the property of time to (seemingly) only flow in one direction, as astronomer Arthur Eddington conceptualized cca. 1927

⁷¹ Relativity of perception, as described in the previous chapter

this example we are only interested in the spatial manifestation of consciousness): $(C_{n_1}^{b_1}, C_{n_2}^{b_2}, \dots, C_{n_m}^{b_m})$; please see the notation of consciousness in a biased / subjective universe as described in the previous chapter. In the context of superposition and synchronization, we can define time as an emergent mathematical function of a consistency and continuity that is sufficient to preserve consciousness of any size on a cosmic scale:

- consistency: put simply, if at one point in time an electron and a proton form an atom, this same atom can be split back into a proton and electron - what goes in must come out - i.e. conservation of information / probability;
- continuity: entities perceive time through the continuity of their own particles. The function of time emerges from the fact that at some subsequent space-time markers, the particles that we are made of are pre-generated and recur endlessly⁷². Space plays out in front of our consciousness resulting in our feeling of time because of memory: the function of time modifies our neurons (inside a larger cause-and-effect paradigm) to remember the space that has played out at every single moment in time. We do not remember future moments: we are not yet at those points in time where time itself stores that future perception of space and the sequence in which it plays out.

Time is a function *t* of the form

 $t(C_{n_1}^{b_1}, C_{n_2}^{b_2}, \dots, C_{n_m}^{b_m}) = (C_{x_1}^{y_1}, C_{x_2}^{y_2}, \dots, C_{x_p}^{y_p})$ where $(C_{x_1}^{y_1}, C_{x_2}^{y_2}, \dots, C_{x_p}^{y_p})$ is the same person at a moment t_2 . When t_1 and t_2 are sufficiently close, sufficiently many particles will coincide between $(C_{n_1}^{b_1}, C_{n_2}^{b_2}, \dots, C_{n_m}^{b_m})$

⁷² Not so endlessly that we become immortal, at least in the physical sense...

and $(C_{x_1}^{y_1}, C_{x_2}^{y_2}, ..., C_{x_p}^{y_p})$ so that the person has a sense of both its own continuity and a sequence of spatial experiences (a *sequence* only due to the fact that time is consistent even as low as cellular, molecular, atomic and subatomic levels, so that the minuscule state changes of these particles allow for our brains to store information based solely on the influence of space in present time). Time (and space-time) is, in essence, the emergence of continuity and consistency from the probabilistic tree, based on recurring patterns of consciousness entangled with different space-time locations.



In the diagram above you see an attempt at representing the emergence of time from pre-generated possibilities (or better said: probabilities), on which we zoom in below:



Depicted as triangles are probabilistic subtrees: in the vast randomness some elements recur in (cvasi)consistent and (cvasi)continuous manners, sufficiently so that they form increasingly complex recurring patterns capable of perceiving (and by their own time-induced state change that occurs as a consequence: persisting) increasingly complex experiences⁷³.

Let's attempt the same analogy based on a sequence of collapses that was modelled in the previous chapter. For this we revisit the same exact sequence that was used there, as a starting point, including the nonrecurring space-time marker particles:

$$\varepsilon, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \frac{\varepsilon-\varepsilon^2}{2}, \varepsilon^2, \frac{\varepsilon^2}{2}, \frac{\varepsilon^2}{4}, \frac{\varepsilon^2}{8}, \dots; \frac{\frac{\varepsilon-\varepsilon^2}{2}-2\varepsilon^2}{2}, \frac{3\varepsilon^2}{2}, \frac{3\varepsilon^2}{4}, \frac{3\varepsilon^2}{8}, \dots; \dots$$

As a side note, this sequential representation can be obtained by intersecting collapses from right to left in the probabilistic subtree that describes the subjective universe:

⁷³ Spatial, in the material and three dimensional sense as we tend to think, but perhaps not only



Instead of using the ε notation, for simplicity, I will generically mark pregenerated recurring probabilities (elementary particles / instances of consciousness) with letters and unique space-time markers with *ST*. Note that these numbers will not mark the sequence of time, but rather a decreasing evolution of probability:



The circled particles might be in sync and in proximity around certain space-time markers and might even form a collective consciousness (depending on their level of synchronization). This matrix is not meant to be accurate but to illustrate in yet another way how spatial identity and time-related state changes within this identity can occur at various space-time markers, not necessarily in an order that can be depicted - the sequential way in which we represent these probabilities can only be arbitrary; the flow of time however is governed by the synchronization and the superposition of particles / entities / systems / subsystems themselves. Time may flow in multiple directions inside our top-down representation of the probabilistic tree; these directions are only relative to those elements of consciousness which obey the consistent set of rules modeled within the function of time (time may be only one of such functions, but this is, perhaps, a topic for another chapter).

A simple interpretation of the last few pages is that time is a spatial dimension (in line with the unified view of space-time).



Venn diagram of constructs (version 7): +Time

Chapter 13

Conjecture 3:

Sync-Based Attraction & Interaction

Electromagnetism, strong force, weak force and gravitation are the expression of probabilistic synchronization⁷⁴ in a subjective⁷⁵ universe.

In "traditional" physics, attraction, under its various forms, is expressed as a function of distance (among other parameters) and exerts itself over time. For example, Coulomb's law states that $F = k_e \frac{q_1 q_2}{r^2}$ where *r* is the distance between the charges. In more tangible terms (and switching to gravitation), let's imagine there is a rocket with a current altitude of one mile and its fuel has run out. It will, naturally, start to fall and the fall is, seemingly, manifested by time - had time not played out, the rocket would remain suspended one mile up in the air. However, if time is an emergent dimension of space-time, there must be a space-time-intrinsic property that determines attraction of any kind. At the moment we only know of one property that results from the quantification of probability / consciousness: synchronization. Let's revisit the generic formula for collective consciousness obtained at the end of chapter 10:

$$C(\sum_{i=1}^{n} E_{i}, o) = S(E_{1}, E_{2}, ..., E_{n}) \times \sum_{i=1}^{n} C(E_{i}, o)$$

⁷⁴ Synchronization, as defined at the end of chapter 10

⁷⁵ Subjective universe, as defined in chapter 11

And now let us think about planets and why they might exert gravitation. A planet is a massive object which one could view as a whole, as a single immense entity, or as a collective consciousness: of particles that are synchronized in certain aspects⁷⁶(revolving around the planetary axis, around a central star, etc.). This synchronization can be, of course, quantified as per the formula above, but this synchronization among particles does not simply end at the planetary surface as the planet is not a discrete quantity. There is a field of synchronization (containing many types of particles) with values that are higher around its core and that gradually decrease as you leave the surface and atmosphere. This field acts on less and less dense / massive particles and particle combinations towards the edge of its influence, resulting in an increasingly invisible force of attraction (gravitation).



In the attempt to discover the mathematical foundation for a cloud of synchronization such as this (and why it determines the proximity of objects over time) we need to resort to some basic case studies. Let's assume an object is launched from an arbitrary location in space and passes within the vicinity of Earth; there can be several outcomes:

⁷⁶ Including a certain movement inward, which is, in fact, gravitation



Outcome 1 - Object might be hardly affected



Outcome 2 - Trajectory is influenced



Outcome 3 - Object is caught in a stable orbit



Outcome 4 - Object is caught in a decaying orbit

Let's directly examine outcome 4: the object is entangled with a force (or force-exerting consciousness) F and throughout space there is not much to break this entanglement. In the vicinity of Earth, however, the object begins to lose from its original intent (entanglement) and begins to gain in synchronization (entanglement) with Earth. What determines this variation in synchronization? We can try to describe the variation in four arbitrarily chosen space-time points along the object's trajectory:



a is the space-time point where object o_a becomes entangled with F;

b is a space-time point somewhere in outer space before any other significant influence. The collective consciousness of the object is notated with o_{b} and it is still strongly entangled with *F*;

c is the point in space-time where the object begins to lose entanglement with F and gain entanglement with E (Earth);

d is a point in space-time where the object lost most (if not all) of its entanglement with *F* and is (cvasi)maximally synchronized with *E*.

We can see how one strong synchronization is replaced by another and, should this replacement not take place, the object would still be synchronized with the original force F. Synchronization, however, is a property that emerges from consciousness probability (specifically its additivity, as described in chapter 10) and time is a property that emerges from the consistent and continuous evolution of consciousness / probability as it is entangled with various space time points.

Let's explore the example further:

- Initial situation (object was at rest):
 - $S(o_0, F) = 0$ (no force acted upon the object yet)
 - $S(o_0, st_0) \sim 1$ (as the object was at rest and there was a high probability that it could be entangled / perceived at that space-time)
 - $S(F, st_0) = 0$ (the force had not influenced the object's space-time marker either)
 - $S(o_0, E) = 0$ (the object was far from being influenced by the planet)
- Force acts upon the object (e.g. space-time *a*):
 - $S(o_{a'}, F) \sim 1$ (the object and force are now in almost perfect sync)
 - S(o_a, st_a) << 1 (as the object moves in full force there is a low probability that it will be perceived at a certain space time)
 - $S(F, st_a) >> 0$ (space-time is warped in the direction of the force; i.e. space-time becomes entangled with the force as well; however, most of the entanglement stays with the object)

- $S(o_{a'}, E) = 0$ (the object is still not influenced by the planet)
- Object is in motion (e.g. space-time *b*):
 - $S(o_{b'}, F) \sim S(o_{a'}, F)$ (levels of synchronization between object and force are still quite high)
 - $S(o_a, st_a) < S(o_b, st_b) << 1$ (the object is on an inertial trajectory)
 - $S(F, st_a) > S(F, st_b) >> 0$ (space-time still warps the direction of the initial force, not because of the force itself but because of the object's still high entanglement with that force)
 - $S(o_b, E) \sim 0$ (the object is still not influenced (entangled, synchronized) by the planet, but is closing in on its area of influence (entanglement, synchronization))
- Object is starting to gain entanglement with the planet *E* and starting to lose entanglement with the initial force *F*(e.g. space-time *c*):
 - $S(o_{c'}, F) < S(o_{b'}, F)$ (decreasing sync between object and force)
 - $S(o_b, st_b) < S(o_c, st_c) < 1$ (as the object is seemingly slowing down, at the probabilistic level its particles begin to gain synchronization with the space-time on its trajectory - i.e. it's beginning to be likelier to find an object at a point in space-time as it slows down)
 - $S(F, st_b) > S(F, st_c) > 0$ (space-time itself is still warped by the object's residual entanglement with *F*)
 - $S(o_{c'}, E) > 0$ (the object is beginning to entangle its particles (and its own field of synchronization surrounding its strictly material form) to the consciousness / force of Earth)

- Object becomes (cvasi)maximally⁷⁷ synchronized⁷⁸ with the Earth:
 - $S(o_{d'}, F) = 0$ (no more entanglement between object and force)
 - $S(o_d, st_d) >> S(o_c, st_c)$ (the object is now stationary, at least compared to the planet)
 - $S(F, st_d) = 0$ (space-time is obviously no longer warped)
 - $S(o_{c'}, E) \ll S(o_{d'}, E) \leq 1$ (the object is now as entangled as possible to the planet)

 o_{d} , o_{b} , o_{d} , o_{d} are the object's variation in (collective) consciousness through the moments of spacetime 4 $o_d = t(o_c), o_c = t'(o_b), o_b = t''(o_d)$ and so on. Therefore, the ubiquitous field of entanglement / synchronization manifests itself in relation to time. This field encompasses relative and continuous entanglement not only between arbitrary consciousnesses but also between consciousness and space-time and between space-time markers themselves⁷⁹. Actually, I surmise that attraction, together with time as we perceive it, emerges as a result of the entanglement field and that this field is surprisingly similar to (and most likely determined by) the fractal nature of the universe. Let's consider the fractal schema of consciousness as presented in chapter 10. We will then zoom in on the marked transition from entropy to certainty.

⁷⁷ As much as an object can become synchronized with a planet. A planet is not a perfect sphere itself, so one can not even say about the surface of the planet (mountains, valleys) that it's perfectly and uniformly synchronized with the supposedly spherical nature of the planet. Perfect sync (of value 1) could arguably only be obtained on a large-scale inside black holes, but perhaps not even there.

⁷⁸ After basically crashing into it. Breaking the object into pieces is another way of the planet to increase its own entanglement with the object while decreasing entanglement with its original parameters.

⁷⁹ They are of course consciousness quantified as probability as well





Consciousness, in its fractal nature, will *split* its surrounding space into its own *divisors*. It will replicate itself governed by a decreasing exponential function (roughly⁸⁰ 2^{-x} in the objective universe) generating **space-time curvature**.

I see the concept of space-time **warp**, as mentioned in the above analysis of outcome 4, to be a localized effect enabled (not determined⁸¹) by space-time curvature. I don't mention it idly, since curved disentanglement and re-entanglement might one day, in my opinion, be the principles of long-distance space travel. We could also define a *warp trail* or *warp wake* as the residual entanglement of intentional warping of space-time or of an object entangled to space-time.

⁸⁰ We are modelling reality in a subjective universe, therefore curvature and probabilities probably vary.

⁸¹ Warp seems to be determined by intent, which seems to be generated by arbitrary / recurrent patterns of consciousness. Nonrecurrent particles such as space-time markers can not warp themselves by themselves, there must be intent behind it (i.e. warp is not natural)

Attraction and synchronization become, in essence, a problem of factorization in the subjective universe: attraction is the manifestation (via the vector of perception) of divisors by the attractor. Divisors entangle gradually with the attracted (which manifests its own divisors as well but which will get cancelled out / reduced⁸² if the overall quantity / probability of consciousness is smaller). For the sake of argument, let us model some amounts of consciousness inside the objective universe: $C_{A} = \frac{1}{16}$. Its fractalization (synchronization cloud) would consist of: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$. If $C_n = \frac{1}{2^n}$ it would be pretty obvious that any consciousness C_m that we would pick with m finite would be perfectly synchronized with C_n . Let us pick m = 7 for example: $C_6 = \frac{1}{64}$ and its fractal synchronization cloud would be $\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$. We can immediately see that one consciousness (complete with its synchronization cloud) $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ is fully included in the other. Factorization becomes apparent as we move towards the subjective universe. $C(o_1)$ and $C(o_2)$ (collective consciousnesses of two objects) might no longer be based on perfect powers of 2. Let us, again, assume, for the sake of argument, that $C(o_1) = \frac{r}{t}$ and $C(o_2) = \frac{q}{v}$, both irreductible fractions with $r, t, q, v \in N^*$.

1. Let's multiply both values with $t \times v$ so that we can compare integers.

 $C'(o_1) = rv$ $C'(o_2) = qt$

2. Let's produce their prime factorizations:

⁸² See the next pages on the notion of *reduction* - it is basically a mapping from mathematical reduction of factors to reduction of spatial distance

$$C'(o_{1}) = p_{1}^{i_{1}} \times p_{2}^{i_{2}} \times ... \times p_{s}^{i_{s}}$$
$$C'(o_{2}) = p_{1}^{k_{1}} \times p_{2}^{k_{2}} \times ... \times p_{s}^{k_{s}}$$

where p is the series of prime numbers (2, 3, 5, ...) and s is a sufficiently large index to describe both factorizations.

Synchronization between the two objects⁸³ depends on the distribution / variance of exponents in the *i* and *k* series. I surmise that if:

$$i = \{0, 1, 0, 3, 0, 2, 0, ...\}$$

$$k = \{2, 0, 4, 0, 1, 0, 4, ...\}$$

i.e. if there exist many indexes $d \in N^*$, $d \leq s$ such that $i_d \times k_d = 0$ then the consciousnesses / probabilities of the two objects would be composed of so many unique factors⁸⁴ that they wouldn't basically interact⁸⁵ to a great degree.

If, on the other hand, the values of corresponding exponents are similar:

 $i = \{7, 5, 0, 6, 9, 0, 0, ...\}$

 $k = \{6, 6, 1, 7, 10, 0, 0, ...\}$

they would be in sync and they would attract each other (as their synchronization clouds would overlap to a large degree). Spatial attraction would result from the fact that time manifests the synchronization field around the two consciousnesses but when they overlap the overlaps aren't manifested twice, they are just manifested once by the universe taken as a probabilistic state machine. As a simple example, if $i = \{2, 1, 1, 2, 0, 0, ...\}$ and $k = \{2, 1, 2, 1, 0, 0, ...\}$ then $C'(o_1) = 2^2 \times 3^1 \times 5^1 \times 7^2$ and $C'(o_2) = 2^2 \times 3^1 \times 5^2 \times 7^1$ so $gcd(C'(o_1), C'(o_2)) = 2^2 \times 3^1 \times 5^1 \times 7^1$.

⁸⁴ Factors themselves are sub-consciousnesses of the bigger object.

⁸³ Masses in the classical sense, but *objects* are so much more than their masses or their property of being perceived by arbitrary observers such as humans

⁸⁵ I believe two objects that repel each other do so as a result of other forms of attraction in bigger contexts. Therefore the two directions of interest are: interaction and non-interaction.

 \sim

The factors that can not be synchronized would be:

 $\frac{C'(o_1)}{gcd(C'(o_1), C'(o_2))} = 7 \text{ and } \frac{C'(o_2)}{gcd(C'(o_1), C'(o_2))} = 5.$

7 and 5 are co-primes and have no greatest common divisor other than 1. One of the effects⁸⁶ of time, in this acceptation, is that, as the fractalizations of two consciousnesses begin to overlap, overlaps are reduced⁸⁷ so that fractalization integrity⁸⁸ is preserved.

Probabilistic space-time expression of attraction / interaction / sync

If two entities of probability $C(o_1)$ and $C(o_2)$ can be quantified, proportionally, at a larger scale, such that the quantities can be represented as prime factorizations⁸⁹, then the attraction / synchronization between⁹⁰ them at a given distance in space-time would be given by:

$$S(o_1, o_2) = \frac{s - \sum_{d=1}^{s} \frac{|i_d - k_d|}{\max(i_d, k_d)}}{s}$$

where S is synchronization / attraction prior to reduction, s is the size of the space that sufficiently describes the diversity of elementary particles for both entities, i and k are the series of exponents for the two prime factorizations;

A continuous, analog expression would be:

$$S(o_1, o_2) = \frac{s - \int_0^s \frac{|i(x) - k(x)|}{max(i(x), k(x))} dx}{s}$$

⁸⁶ But also a fundamental catalyst for the development of time-perceiving entities
 ⁸⁷ Only represented once. The two objects begin to efficiently unify into a new object that only contains both sets of distinctiveness. Spatial attraction is spatial reduction.
 ⁸⁸ Two adjacent consciousnesses of identical probabilities will become one consciousness of the same probability instead of entangling by generating unnecessary, redundant fractal / synchronization clouds towards each other.
 ⁸⁹ Each factor representing, in essence, the probability that a certain type of elementary particles exists within the object

⁹⁰ In a hypothetical, closed system formed by the two objects alone and their fractal clouds and separated by nothing but space-time



Interpretation

- 1. Entanglement is a ubiquitous field. It can connect physical particles with space-time, physical particles with consciousness and intent (all three are the same in any case) and it binds together space-time;
- 2. Velocity is part of the identity of an entity. An entity is entangled with its velocity; velocity is a part of the entity;
- 3. Velocity is only a spatial effect of the underlying entanglement: between the entity and the forces that act (or acted) upon it. It's more precise to say an object is entangled with a force / entity / consciousness that sent it flying through space until crashing into a planet will completely⁹¹ disentangle it from that force and entangle it with the planet;
- 4. Gravitation (and synchronization / attraction of any kind) can be interpreted in the context of space-time as the unification of perspective / perception of two entities which come in sync. If an object is within gravitational pull and it starts to fall, it will basically be unified with the planet as synchronization increases to the point that the object crashes (and subsystems that reside on the planet (such as a hard planetary surface) produce their own entanglement with the object);
- 5. If particles that mediate attraction, such as gravitons or gluons, exist, they would exist with a certain probability within the synchronization field;
- 6. Our relative experience of life is closer to being determined by variations in the field of synchronization than by the absolute values and variations of consciousness themselves; however,

⁹¹ Completeness is relative. If an object ends up on a planet because of a certain force that sent it there, will the object ever be truly disentangled from that initial force?

variations in consciousness determine variations in the field of synchronization, of course;

- 7. The probabilistic expression of gravitation, strong/weak and electromagnetic forces is consistent with Einstein's special and general relativity;
- The expression of a fractal / synchronization field (together with the superpositional nature of entropy) is also consistent with the Casimir effect⁹²

Appendix 8 also contains some further considerations on the speed of light in the context of probabilistic space-time and interaction.

The following Venn diagram of constructs is updated to reflect synchronization and attraction as a conclusion for this chapter.

⁹² Please see appendix 8 on the idea of void vs. dark matter / aether



Venn diagram of constructs (version 8): +Synchronization +Attraction

Chapter 14

Multiple Dimensions

There are several meanings which people attribute to the notion of *multiple dimensions*. Probably the most popular ones are:

- parallel worlds or "other dimensions" perhaps populated by alien-like creatures with various degrees of compatibility with reality as we perceive it;
- similar worlds, in superposition, inhabited by slightly different versions of ourselves, defined, perhaps, by diverging individual choices⁹³ or universal attributes;
 - a particular version of this view is based on well-defined⁹⁴ timelines, as often⁹⁵ depicted in sci-fi that deals with time travel, in which a single event can alter history at a grand scale a good premise for the "entertainment value" of time travel as it can result in the erasure of individuals from existence or dramatic, unexpected outcomes;

Another meaning, which is, perhaps, also the most tangible one, is the one that directly derives from a geometric perspective:

⁹³ A view quite compatible with the Many-Worlds interpretation of quantum mechanics

⁹⁴ One could "trace" a timeline through decisions / measurements

⁹⁵ Back To The Future



• space and, specifically, the position of any material object in space can be defined via three orthogonal dimensions (axii) - they are assumed to unequivocally describe positions and distances locally and globally compared to a given frame of reference / point of origin; these dimensions / axii, usually marked as *OX*, *OY*,*OZ* in geometric representations are the source of our three-dimensional perspective on space in our day-to-day lives.

I will begin by exploring the latter as it's more grounded in observation and gives us a good starting point.

Spatial dimensionality

The first (and maybe the most important) question that I ask myself where "spatial" dimensions are concerned is: why are there three of them? Why are a set of three coordinates enough to describe a unique position compared to a point of reference, at least in the observable universe? Why is it three and not four or two? To answer such a question we need to find a model for spatial dimensionality - or at least a model for the growth of dimensionality.

Lemma: Discrete Dimensional Incrementation

The first thing to note is that when we say *growth of dimensionality* we actually mean incrementation: i.e. we can refer to a concept that represents some sort of elementary particle (zero-dimensional), we can refer to a concept that lives on a line (one-dimensional) or on a plane (bi-dimensional), or we can refer to a real-life, macroscopic object (three-dimensional). We see that dimensionality is in fact an integer, always incremented by 1 in this set of examples but in science as well. We do not⁹⁶ really see scientific theories of the current time making claims that a concept can live in 1.5 or 2.5 dimensions.

⁹⁶ At least to my knowledge

Model: Generic Dimensional Incrementation

We often come in contact with explanations on how to progressively imagine subsequent dimensions, such as: if you want to jump from zero dimensions to one dimension: just draw a zero-dimensional shape (point) many times, in sequence, to form a line; if you want to jump from one dimension to two dimensions: just draw a two-dimensional object (line) many times (at least two times), in sequence or as an intersection, to form a plane. Then we have a problem: to imagine a three dimensional object on a sheet of paper we can not truly draw or intersect multiple planes on that same sheet of paper so humans have come up with a clever convention - I call this convention *rationalization* for reasons that will become apparent later - that they can represent multiple planes differently on the same sheet of paper by drawing lines differently (e.g. as dotted lines). The same problem grows bigger if we want to think of four dimensional objects: there simply is no objectively satisfactory way to do this, for several reasons:

- the rationalization that we established for jumping from 2D to 3D does not hold anymore;
- we, as humans, probably represent 99% of geometry for whatever purpose (educational, recreational, etc.) on bi-dimensional mediums such as sheets of paper, on-screen videos, etc. so I think I can safely make the claim we are barely⁹⁷ experienced in the flexibilities of dimensional representation;
- most humans have two eyes which takes away the need for *rationalization*; we have the convention built into our bodies and processed almost automatically by our brains. It allows for simulated three-dimensional experience in VR or 3D cinema they are still simulated because they are still essentially represented on a 2D surface.

⁹⁷ Perhaps with the advent of VR (Virtual Reality) and VR devices our experience in this field will grow

So we, as a species, seem to have developed a certain bias⁹⁸ towards 2D representations of objects that are 3D or greater. One way to create a model for dimensional incrementation that goes beyond this bias is to decouple incrementation from representation. To go even further, we are extremely bound to our photon-based (visual) perception of reality that further binds us to propagation of spatial information in straight lines.

Let us conduct a thought experiment by taking the example of a particle P that experiences the universe on a line (essentially living in a one-dimensional world). If the particle is currently at point A and wants to move to point B, it has to experience all the points between A and B.



In other words, assuming information travels only in the same one-dimensional medium as well, if the particle wants to "see" / "measure" point B, it has to go through (and measure) every point on the way.



So particle P would have to change its coordinate in this one dimension to achieve its purpose. But what if particle P would not have to change its coordinate / position and would instead find a more direct method of measuring the particle that resides at point B? For example, as particle P elevates itself by changing its position in a different dimension it could repeatedly and successively send photons towards point B while also

⁹⁸ No doubt also for valid, economic reasons. It's easier, cca. 2018, to get a hold of a phone, tablet, laptop or a sheet of paper and a pencil than to find a holographic projector, a versatile 3D printing pen or capable CAD software that can be used intuitively enough by the majority. It just isn't feasible yet to create (interactive) 3D representations on a large scale.

measuring the reflections that are coming back from point B, thus eliminating the photon-blocking obstacles in the initial dimension.



Thus, we can say particle P found an extra dimension in which it can perceive (measure / entangle itself with) whatever exists at point B - but we must also note that the extra dimension is only relative (and relevant) to the participants in the exchange of information. The particles between A and B still don't know about the extra dimension. Please also note that there need not be an actual spatial movement. If particle P finds an object that is capable of relaying the information in the extra dimension, actual movement is not necessary.



This experiment reveals that one way to think about dimensionality is to strip arbitrary properties from it like material space or spatial movement by reducing the issue to transmission of information and entanglement. Based on this thought experiment, we can attempt a key definition.

Definition: Dimension

A set of particles $\{P_i, P_{i+1}, ..., P_{i+j}\}$ where P_{i+k} is only entangled with P_{i+k-1} and P_{i+k+1} on a set informational channel represents an arbitrary dimension for the particles within the given set.

$$\begin{split} S_{IC}(P_{i+k}, P_{i+k-1}) &> 0, \ S_{IC}(P_{i+k}, P_{i+k+1}) > 0, \ \forall \ k \ \in (0, \ j - i) \\ S_{IC}(P_{i+k}, P_{i+t}) &= 0, \ \forall \ k, \ t \ \in (0, \ j - i), \ t \neq k - 1, \ t \neq k + 1 \\ \text{where } S_{IC} \text{represents the synchronization on the set informational} \\ \text{channel.} \end{split}$$

What humans generally mean when claiming the world is three dimensional is basically that:

- they can establish the exact position of objects (even celestial ones, let alone objects from day-to-day life) with a high degree of precision; for example, on Earth we can use latitude, longitude and altitude to find an object very precisely; note that the exact definitions of these 3 dimensions within this coordinate system is a matter of convention and artificial.
- they can establish the relative position of objects: some being closer and some further, even with their own eyes;
- they can establish unique positions for objects: multiple objects can not exist at the same, precise location.

If we were to map the formal definition of a dimension that I made above to our collective (but local) observations we could say that our perception of the world being three-dimensional is generated by an extremely high probability⁹⁹ that we can initiate entanglement with precise objects / entities via a maximum of three initial informational channels.

⁹⁹ High in the probabilistic region that we perceive ourselves in
\sim

In three-dimensional terms, we have to first locate the objects that we wish to interact with before we can interact with them.

Our photo(n)-sensitive organs entangle us to various targets sufficiently well - our vision probably uses:

- two strong photon-based informational channels (as the retina receives 2D);
- two weaker ones:
 - the parallax effect for strong perception of depth (which is interestingly time-based);
 - two eyes for a smaller amount of depth perception and for our own biological version of HDR.

So our biological vision is not quite an accurate 3D representation but it is way more than simple 2D.

Let's make another thought experiment: in front of us is a wall - we can not see past it. Behind the wall is a ball - we don't know how close or how far from the wall. This position (defined by the distance between the ball and wall) is in fact a superposition of many possibilities - it can be 1 mile away, it can be 10 miles away, it can be so far away behind it that it's almost in front of it. It is only when we find a method of (further) entanglement - an extra dimension (i.e. by moving to the left or to the right or by elevating ourselves to be capable to have a look above the wall) - that we can reduce (collapse) this superposition.

From the lemma of discrete dimensional incrementation, the model of generic dimensional incrementation, the two thought experiments and the considerations on biological vision and informational channels I conclude that three-dimensionality is an arbitrary¹⁰⁰ rationalisation of our inherent and extremely likely capacity to initiate entanglements with

¹⁰⁰ But useful

objects of interest by using up to three informational channels in this probabilistic region of the universe.

Interpretation

We already know the gravitational pull is so strong that it can bend light. By our rationalizations, we choose to model this gravitational pull as a property of four-dimensional space (space-time). Instead we could consider it an extra-dimensional manifestation that is entangled with four-dimensional space-time. If our eyes would have been capable of perceiving gravity and not just photons, wouldn't we have done so? The same question stands with our tactile sense: it's by virtue of our tactile sense that we judge things as material - it actually interacts with subatomic forces, not touching anything, but being repelled by the infinitesimal forces in a build-up that amounts to a sensation / interaction. If our eyes would have also been able to perceive the synchronization cloud that leads to subatomic electromagnetic attraction and repelling, wouldn't we have modelled those forces as dimensional manifestations instead of mere physical properties?

I also surmise dimensionality builds up from the infinitesimal level. A symmetric, homogeneous, elementary particle can only experience the passage of time as a zero-dimensional entity in a one-dimensional medium. These particles begin to combine, forming asymmetric, less-homogenous entities that are capable of entangling themselves with the surrounding universe on more than one informational channel. This process (perhaps similar to the *Theorem of Free Will* described in chapter 2) amounts to our seemingly ~3D interaction with the world.

Once we go beyond our biological and rational legacy we might be able to model reality as a multi-dimensional field - but I must highlight, again, that these dimensions appear to be arbitrary and relative to the informational exchange which they describe, together with participating entities, medium, information carrier and so on... The purpose of this interpretation is not to convince the reader of multiple dimensions but to remind of the fact that all manifestations come from a ubiquitous synchronization field.

Parallel worlds

We could try to contain both paradigms (interdimensional alien plane vs. alternate versions of the universe) within a diagram since they are quite close from some points of view. They only differ in the amount of residual entanglement that they have with our world.



Parallel worlds would have almost no amount of natural entanglement (which is not to say artificial entanglement could not occur) while alternate worlds have a certain residual entanglement and at least one (if not many) intersection points with the world of reference. Of course, these are just two ends of the spectrum since, in theory, everything is relative and two worlds could be parallel in some probabilistic regions but intersecting in others. A world, from a human perspective, might be a coherent space-time succession complete with its synchronization field (since in the probabilistic view, space-time is an emergent property).

Both possibilities (parallel and alternate¹⁰¹) are compatible with the probabilistic universe. Let's remember one of the diagrams that describes how time emerges from an endless field of recurring probabilistic subtrees:

¹⁰¹ Including endlessly splitting worlds as per the Many-Worlds interpretation of quantum mechanics



A merging of 2 alternate universes could primitively be represented as:



It should be noted that although worlds may intersect / merge in some particular space-time regions of those worlds, it's probably not mathematically mandatory that the entire space-time functions (i.e. worlds) intersect / merge.

The Déjà-Vu Hypothesis

I propose the hypothesis that the feeling of déjà-vu occurs as a result of an intersection (possibly merger) of at least two alternate (sub)worlds around a probabilistic region that at least one person capable of perceiving it is part of.¹⁰²

From empirical observations (of myself having this experience every once in a while) I note that sometimes the feeling of déjà-vu is part of the déjà-vu itself. This resembles a strange echo which may or may not occur, my intuition tells me, at the quantum level.

¹⁰² 2nd edition footnote: After some research on the subject, it appears that this idea might have already been proposed by Dr. Michio Kaku a while back. However, I can only find videos on YouTube where he describes the notion of déjà-vu together with the notion of parallel universes without going into too much detail. In his book *Parallel Worlds* we find an analogy of "radios" tuning into different "frequencies", the same analogy that was used in the videos I mentioned. But I couldn't find any references to déjà-vu itself in the book. If someone finds a clearer and more "quotable" reference to déjà-vu by Dr. Michio Kaku (or by anyone else in the context of worlds intersecting) please let me know so I can in turn properly research/reference/quote them)

Chapter 15

On-Point Interpretations

The probabilistic representation of the universe entails, in essence, a quantum model for the world we live in. Here are my summarized conclusions and human readable interpretations in the eventuality this model is correct (to be concise, I will separate details into footnotes)

- 1. At least one¹⁰³ ordered and consistent universe¹⁰⁴¹⁰⁵ is bound to emerge from maximum entropy.
- 2. Relatively exotic forms of transportation (including FTL) are not only *possible* but also *likely* to have been implemented across multiple space-time continuums.
- 3. The universe is biased towards balance¹⁰⁶.
- 4. The phenomenon that we call consciousness is not simply an exotic property exhibited by biological minds, but it is ubiquitous

¹⁰³ But probably more than one

¹⁰⁴ The meaning of "universe", in this case, is closer to "a space-time continuum (out of many)"

¹⁰⁵ Such as ours (seemingly we live in a universal bubble where we, cca. 2018, at least think everything is measurable and follows a strict, limited set of physical, material rules)

¹⁰⁶ A coarse-grained expansion of this statement: The universe is biased towards balance between entropy and order, between superposition and collapse.

and strongly connected to fundamental aspects of quantum physics.

5. It's likely that an infinite¹⁰⁷ number of planets are populated in any space-time continuum where planets exist and at least one planet is populated¹⁰⁸.

¹⁰⁷ We tread in the realm of nuance: "infinite" here has rather a meaning of "uncountable", as the physical laws that we know cca 2018 pull the notion of "observable universe" towards a "local bubble" with gradually changing properties as we extend perception towards its far reaches. One could ask, what does "infinite" mean if this bubble is neither bounded nor unbounded but closer to a field where one can define arbitrary rules only for the arbitrary set of physical laws considered? If this footnote is too nuanced, I apologize.

¹⁰⁸ I hope the reader is starting to slowly become permeable to the idea that, if multiple space-time continuums exist and contain planets, then maybe the idea of multiple space-time continuums is a local and arbitrary separation and there might be levels where this separation can be bypassed.

in which I include observations of both formal and informal value

Schrödinger, Shakespeare Of Physics

This idea came into my mind and I initially wrote it down as an original one, but as I was researching for this book I found out other people, such as: *wavewatching.net/2013/03/18/*

fun-stuff-when-shakespeare-meets-schrodinger,

thought about it years before I did. I guess it jumps to the eye that Erwin Schrödinger's question of "Is the cat¹⁰⁹ dead or alive?" is very similar to the famous "To be or not to be?" asked by Shakespeare's Hamlet.



¹⁰⁹ "Schrödinger cat" thought experiment

Of course, entropy, symbolized through a circle, is the "or" in this equation.

To illustrate a problem with the Copenhagen interpretation of quantum mechanics, Schrödinger asked himself how would the state of the cat evolve during an experiment which would place the cat in a box with some explosive / poisonous gas device that has a 50% chance of going off and and a 50% chance of doing nothing. The "problem" would be that the cat is in a superposition of being alive and dead before the box is opened.

The problem that I, personally, see with this thought experiment is that we can not (as of yet and that I know of) create true entropy (randomness) and that the cat, the device and every atomic / subatomic particle in the box exist in a dense field of transitive observation (what we called *synchronization field* throughout the book). So at the space-time scale that we are talking about, the event is already sufficiently observed inside the box for the cat to have a definite state (the cat would in fact be the main observer in the box).

Of course, the discussion can always be deepened, but I wanted to make this statement to support the idea presented in this book: observation and consciousness is ubiquitous even beyond what I called the *subjective universe* in chapter 11. Certain questions¹¹⁰ might sufficiently¹¹¹ collapse certain waves and some others might not but to a certain degree this is constantly happening in every universal state as we defined it. To assume that a complex entity (such as a cat) will allow superposition where its own life is concerned (the cat itself is a "living cat" detector, a human doesn't have to observe it) is, I think, too much. As you may have

¹¹⁰ In a vectorial sense, as represented in chapter 10 on *The Mathematical Emergence Of Consciousness*

¹¹¹ Collapse is relative as I have tried to show in chapter 5 on *Concurrent Observation*. I believe that humanity's collective perception on quantum collapse is still simplistic and arbitrary, cca. 2018, but I am not a physicist / scientist, so please excuse any ignorance that you might perceive on my side...

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inferred by now, the probabilistic representation proposed by this book is in line with the Many-Worlds interpretation, with a nuance:

the universe / multiverse as represented by the probabilistic tree, pre-generated not only the objective universe but the subjective one(s) as well, including every unique space-time marker. It is only the function of time - which plays out a sequence of state transitions that make sense within the set of physical laws that keep the space-time pocket¹¹² that we live in consistent - that gives our (cvasi)persistent evolved, biological consciousness the impression that the world should "split" (in the Many-Worlds sense) and that this split is time dependent.

¹¹² Called by many "observable universe" - but in the three-dimensional, material way. Throughout this book, by *universe*, if not referring to a particular universal state, I actually mean everything that exists regardless of it being observed by humanity: multiverse as a superpositional collection of universal states (be it subjective universe or beyond), originating from ultimate entropy and probabilistic in nature.

"The Universe Is Flat"

The shape of the universe might still be a matter of debate at this point, but, in any case, the idea that the universe is flat has been in circulation for quite a while accompanied by theoretical arguments and practical observations. This is not necessarily relevant to the probabilistic representation of the universe, but, still, some observations can be made on this topic.

First of all, there are at least three additional perspectives, defined by this book, from which the universe seems flat or even zero-dimensional:

- punctiform due to superposition everything is happening in superposition with U_0 which has an entropy of 1 (100%)¹¹³;
- bidimensional model given an infinite sheet of paper we could represent the entire probabilistic tree¹¹⁴;

Note that these points refer to the entire, objective universe.

¹¹³ To say that U_0 is a point would even be an overstatement.

¹¹⁴ Which would make the universe bi-dimensional or less, considering that our representation is probably one that is less efficient than the universal state machine

The third point actually refers to the observable universe (which is within the subjective universe):

• quick flattening of the generic function that describes recurring patterns: $\frac{\sigma(\log_2 \omega + n)}{2^m}$

(which probably describes most of the observable space-time as $m, n \to \infty$)

My feeling is, however, that the topic of "universal shape" is coming from a measurement-based species. If the subjective universe derives from an infinitesimal quantity of entropy - but entropy, nonetheless - it's not surprising to me that if we look far enough and we become conscious enough, we start to notice how information (and informational channels) fall back into superposition. This book basically describes the universe as a mathematical phenomenon. Can this phenomenon have an objective size? In a way, it's like asking a fractal what size it can have - the correct answer to this question would be: it's a fractal¹¹⁵. On the other hand, perhaps there are formal ways in which the self-similarity of a fractal can be quantified.

¹¹⁵ Name: Johnny Bravo. Occupation? Johnny Bravo.

Superpositional Semantics

To start with a "quantum" pun, the initials of *Consciousness / Collapse* and *Universe / Uncertainty* are coincidentally the same. Cross off "the initials of" from the previous phrase and the statement might still be true...

Throughout the book, as I've tried to build a unified theory some common meanings and causes have begun to emerge that bring together concepts which are quite particular in classical contexts. Hoping that, as you've read along, I've managed to give appropriate reasonings for the unification of certain models and constructs, here is a list of semantic congruences for any kind of reference:

- Collapse / Consciousness
- Entropy / Uncertainty
- Question / Perception / Measurement / Observation
- Synchronization (Sync) / Entanglement / Attraction / Interaction
- Object / Entity / Collective Consciousness

Following is a list of semantic congruences that are even "more specific" to the probabilistic representation and this book:

- Spatial Attraction / (Factor) Reduction
- Fractal(ization) Cloud / Synchronization Cloud
- Subjective Universe / Biased Universe
- Space-Time Marker / Space-Time Particle

Venn Diagram Of Constructs





Notation Of U_{∞}

In several formulas 116 throughout the book, I have used the expression: $_\infty$

$$\bigcup_{i=k} U_i$$

which is slightly redundant because, as mentioned in chapter 9, $U_n \subset U_{n+1}$ and, therefore, it would have been easier to use a notation such as U_{∞} . I chose not to use such a notation and to use explicit reunion of universal states because it's more intuitive and, still, it's more accurate due to the incipient index - so it can be followed with more ease within the respective contexts. For the sake of completeness I can state within this appendix that:

 $\bigcup_{i=k}^{\infty} U_i = U_{\infty}$ formally represents, within this model, the entire universe¹¹⁷

I will still consider $\omega < \infty$ so, for example, $U_{log_2\omega} \subset U_{\omega} \subset U_{\infty}$

¹¹⁶ e.g. chapters 9,10

¹¹⁷ With all states in superposition

Recurrence & Increasing Bias

Recurrence emerges in a biased universe regardless of the function that models bias growth. Let us consider, for a moment, the function that governs the probabilistic tree, $\frac{1}{2^x}$:



Let us now model what happens at $x = log_2 \omega$, the order of magnitude where we convened a subjective universe might begin (where the asymptotic behaviour of $\frac{1}{2^x}$ is quite pronounced, resulting in a cvasi-horizontal line), considering the hypothesis that $\forall y = \sigma(b), \exists a < b$ such that $y = \sigma(b) = 2^k \sigma(a)$.



Geometric proof of recurring strands (not at scale)

 σ , as long as it's continuous¹¹⁸, only has to be increasing enough so that at some point (in the infinitesimal¹¹⁹ realm) it intersects the standard, non-biased evolution of probability $C_x = \frac{1}{2^x}$ so that Lemma 3 (of *Recurring Spatial Patterns*) can be fulfilled. Therefore, any y you pick, not only will there be an a such that $y = \sigma(b) = 2^k \sigma(a)$, there will be an infinity of a's that meet this condition as you change the value of k; because of superposition in the infinitesimal realm in conjunction with the perceived analog nature of reality, I assume¹²⁰ $k \in R_{\perp}^*$.

¹¹⁸ Which, in chapter 11, we only modeled as discrete in an infinitesimal realm as a proof of concept, but reality is analog and superpositional, so I believe it's plausible to consider σ continuous

¹¹⁹ Infinite values for *x* actually

¹²⁰ In other words, I assume it works not only for integer values of k but also for real values

Akashic Record

I would like to state, from the beginning, that I am not an adept of any religious, philosophical (or other kinds of) movement / current¹²¹. I would only like to dedicate at least one page to the idea of compatibility between spiritual beliefs and the probabilistic representation of the universe. An interesting exponent for this idea that presented itself on new media channels, in the months and years prior to the writing of this book, is the concept of the *Akashic Record*. It is considered, by several beliefs, to be a compendium of all events and intents that ever manifested in the past, manifest in the present and will manifest in the future. The only reason that I mention it here is that this concept, on which I happened to stumble long after I formulated the main pillars of my theory, is intriguingly compatible with the idea of pre-generated probabilistic universe.

¹²¹ Which is not to say, in essence, that there would be anything wrong with it. I just want to make it clear that I have no "affiliations". My main drivers are observation, reason and intuition.

Dark Matter & The Speed Of Light

The probabilistic model of the universe doesn't allow for perfect vacuum / void or utter emptiness of space - there is no probability pattern C_n^b (let alone a recurring one) that is equal to 0; it can be close to 0 but not perfectly equal to 0. It allows, however, for the existence of particles with which the material world as we know it has a low probability of interaction¹²²: this is where I would call attention to the theories of aether and dark matter which I will not detail here.

An interesting consequence of an *aether* that is permeating what we perceive as empty space would be that the speed of light is not set in stone to be the maximum speed in the universe: it would only be the speed of a photon hindered by a constant infinitesimal aetheric drag force. This would allow room for (a certain¹²³ amount of) relativity in light-speed computation and for particles with even less entanglement / interaction with cosmic elements as we perceive them that would be able to travel at superluminal speeds.

¹²² Interaction, as described in chapter 12

¹²³ Perhaps small, if only in the context of the observable, material universe

 \mathcal{A}

In other words:

• non-exceptional faster-than-light particles might already exist but they may merely be outside conventional means of perception;

The photon is not a magical particle - neither in the probabilistic representation nor in real life: due to its particular probability photons might have a low probability of entanglement with the medium in which they travel but, however low it might be, it still isn't nonexistent: photons can be reflected by objects, their trajectories can be bent by gravitational force, etc.

Theorem 3: Conservation Of Entropy

Entropy and order neither increase nor decrease at a universal scale.

Hypothesis

In a closed-system universe that originates from entropy alone, both order and entropy are constant.

Contextual¹²⁴ Proof

In the objective universe:

 $\sum_{k=1}^{\infty} C_k = \sum_{k=1}^{\infty} \frac{1}{2^k} = 1 \Rightarrow \text{maximum}^{125} \text{ probability for order}$

There is as much order as possible, in superposition with entropy.

Also, $E_{\emptyset}(U_0) = 1$ (as also stated in chapter 9). With both maximally probable states in superposition, maximum initial entropy and maximum subsequent collapse as a consequence of that entropy, the probability of

the universe existing, such as it is, is $\frac{1}{2}(1 + \sum_{k=1}^{\infty} \frac{1}{2^k}) = \frac{1+1}{2} = 1.$

¹²⁴ This proof emerges naturally from the chapters of this book. Instead of dedicating a chapter to this theorem, I decided to formulate it in the appendix along with a few key aspects.

¹²⁵ The universe doesn't simply contain an arbitrary amount of order (consciousness, collapse). It contains only order, but in superposition with entropy - and the other way around: it contains only entropy but in superposition with order. The word contains is not the best for order: the world *contains* entropy but *produces* order.

For the concepts of objective / subjective universe please read chapter 11, *Recurring Spatial Patterns*. For why the universe is superpositional (with a maximum entropy origin), please refer to Theorem 2 on the *Probabilistic Nature Of The Universe*.

Corollary: Conservation of entropy in the subjective universe

In a subjective universe, let us assume there are two different growth functions for the bias toward superposition (σ_n) and the bias towards collapse (γ_n) . A generic probabilistic subtree (in this example, the root of the subjective universe) would have the following form:



If $\gamma_n < \sigma_n$, $\forall n \ge \log_2 \omega$ it would mean that in a larger (objective) universe that kept entropy and order in superposition with equal probabilities up until the root of the subjective (biased) universe, there would be a sudden decrease in entropy (of $\sigma_n - \gamma_n > 0$ per collapse) and the total probability of collapse in the subjective universe would be higher than the probability of the originating entropy: contradiction. In the same way, if $\gamma_n > \sigma_n$, $\forall n \ge \log_2 \omega$, there would be a sudden increase in entropy of $\gamma_n - \sigma_n > 0$ per collapse inside the subjective

universe (already a contradiction with conservation of entropy¹²⁶ in the objective universe). While this does not guarantee that $\gamma_n = \sigma_n$, $\forall n \ge \log_2 \omega$, substituting γ_n for σ_n has been considered plausible in the exemplification of recurring spatial patterns (chapter 11) as it is in line with conservation of entropy (specifically, a certain amount of entropy is preserved by a weak collapse).

Lemma: A probabilistic subtree that is already biased can not be biased again

The low-probability decay of an already biased collapse is not also biased. In a *reductio ad absurdum* argument, let's assume that all paths are biased:



We defined σ as an increasing function which would mean weak collapse isn't weak and, on the contrary, it is strengthening beyond its initial probability. In addition, entropy resulting from the weak collapse would have a *negative* probability of $\sigma_n - \sigma_{n+1} < 0$ which I will consider a contradiction.

¹²⁶ You will have probably realized by now that, throughout the book, I refer to entropy not as a thermodynamic quantity but as uncertainty in a (cvasi)probabilistic / quantum sense.

Drake's Equation vs. the Fermi Paradox

Or: identifying additional variables in the equation

Drake's Equation is an attempt to approximate the number of intelligent civilizations in the Milky Way galaxy that are broadcasting signals at a particular point in time:

$$N = R \times f_p \times n_e \times f_l \times f_i \times f_c \times L$$

where:

- *R* is the average rate of star formation in our galaxy
- f_n is the fraction of those stars that have planets
- n_e is the average number of planets that can potentially support life per star that has planets
- f_l is the fraction of planets that could support life that actually develop life at some point
- f_i is the fraction of planets with life that actually go on to develop intelligent life (civilizations)
- f_c is the fraction of civilizations that develop a technology that releases detectable signs of their existence into space
- *L* is the length of time for which such civilizations release detectable signals into space

"Opposite" Drake's Equation stands the Fermi Paradox which is the apparent contradiction between:

- the high probability that life exists in multiple places throughout the Universe;
- the lack of evidence for the existence of extraterrestrial civilizations.

My proposal is that the Fermi Paradox constitutes what is generally perceived as a paradox because it incorporates two implied pre-conditions: When one claims "lack of evidence", it can only be claimed:

- from a perspective,
- at a point in time.

If a certain observer, with a limited perspective, does not detect or acknowledge evidence on something, it doesn't mean evidence doesn't exist. Which is followed, logically, by the idea that, in case an observer lacks evidence but evidence might indeed exist, it's a distinct possibility that the observer hasn't detected (or acknowledged) that evidence yet. Mathematically, then: D(o, N(t)) = f(o, t) where:

- N, the number of civilizations that is broadcasting some kind of signal, at a certain point in time, <u>and</u> end up being detected by us is, indeed, not only a function of time but also a function of the observer;
- D(o, N(t)) is the number of civilizations detected by observer *o* from those N(t) that are emitting.

If we are to study the nature of this function f, we should assume both:

- random/accidental components such as the distance between the observer and the closest signal; this does indeed allow for the statistical anomaly that an observer might be very far from any detectable signal for a very long time;
- artificial components the occurrence of the signal depends on the observer's readiness and capacity to detect it.

I believe random / accidental components have already been covered by Drake's Equation. It covers this statistical distribution by defining certain factors as averages, e.g.

- *R*, the average rate of star formation in our galaxy;
- n_e, the average number of planets that can potentially support life per star that has planets.

What is not covered by Drake's Equation is:

- intelligent design that times the signal precisely so that it reaches the observer only under some circumstances: as I defined it above, *readiness and capacity* (or, we can use the notation *rc*)
- reduced capacity to detect signals again, quantified by: *readiness and capacity*, or *rc*(i.e. perhaps we simply lack the technology, at the moment, to detect those signals that are emitted).

It's not my purpose, in this chapter, to define or describe our readiness and capacity to detect a signal coming from an extraterrestrial civilization - I will leave this to the reader. However, the purpose of this article is to generalize Drake's Equation to a point where it's more likely to explain away the Fermi Paradox:

$$D(o, N(t)) = N(t) \times rc(o, t)$$

or, in more Drake-like terms:

$$D(o, N) = R \times f_p \times n_e \times f_l \times f_i \times f_c \times L \times rc(o, t)$$



where:

- *rc* is the readiness and capacity of observer *o* to detect a signal at time *t*;
- *o* is humanity in the Fermi Paradox context.

One could also approximate rc as a product of the two components, readiness and capacity:

$$rc(o, t) = r(o, t) \times c(o, t)$$

Conclusion

The Fermi Paradox is highly dependent on 2 variables: the observers (in this case, humanity) and the point in time when the observations are made. In other words, the Fermi Paradox is only a paradox to us, right now. I submit that, in a quantum / probabilistic world with changing variables, the Fermi paradox itself will be contradicted by reality in the perception of an ever-growing¹²⁷ percentage of humanity.

 $^{^{127}}$ The rate of this growth is, as of yet, undetermined and subject to future observation. But the point of the readiness and capacity factor (*rc*) is to make us realize that the process of getting in contact with an alien signal / civilization can depend on us (humanity) and our state as much as it depends on other statistical, cosmological factors.

Antimatter (and why it "lost" to Matter)

Opinions & Feelings & Conjectures

Antimatter: we know of its potential uses (and actual uses, e.g. PET scans). But how it fits into the probabilistic model is still a bit of a mystery to me. I've thought long and hard about antimatter and I think without more physical experimentation I can only delve in the realm of supposition - however, as you will see below, the probabilistic representation of the universe can account for antimatter as well.

Feeling #1 - Multiple kinds of antimatter

Humanity, at least at the level of public perception, is still very new to antimatter. It feels like we're defining antimatter based on how it interacts with itself and with "regular" matter. Who is then to say multiple kinds of antimatter don't exist? Maybe we're just naming antimatter anything that is not matter, yet the variable(s) that are making it antimatter might not be boolean / binary values, but might be ranges. I wouldn't expand this supposition too much just because it's supposition, but I think that to describe this theory of "multiple kinds of antimatter" we need to find symmetries (between matter and what we generically call antimatter) which we could then model into more than one dimension.



Feeling #2 - What is charge?

Antimatter is, of course (cca. 2019), also defined as particles of *opposite charge* when compared to matter. This got me thinking that charge is what we generically quantify as positive and negative perhaps because it was the only way to account for the electromagnetic force between protons and electrons(?). The probabilistic model, on the other hand, accounts for all types of fundamental interaction - gravitation, weak, electromagnetic and strong - via the notion of synchronization and synchronization fields (see chapter 12). So when antimatter is described as having an opposite charge perhaps this is a direct, almost unconscious and collective effect of its behaviour of being attracted to matter, at least at the atomic scale. But as far as charge is concerned, it seems more like a convention than an actual description of a physical property. This arbitrary and conventional nature of charge is another reason why I think the relation between matter and antimatter is not as binary as we may believe but more fluid.

In the next paragraph I speculate further on this line of thought, conjecting that at least one of the dimensions of symmetry between matter and antimatter is what I defined as bias towards collapse and bias towards superposition, in Lemmas 2 and 3 of Recurring Spatial Patterns (chapter 11).

Antimatter Conjecture: Antimatter is an improbable particle with negative bias towards collapse (positive bias towards superposition)

A particle in the subjective universe would be modeled as a wave, in combination with all its potential collapses. These collapses would be affected by the bias towards collapse (opposite in value to the bias towards superposition):



(diagram above explained in Chapter 11)

Now let's model two particles which might be particle and antiparticle, respectively:



For these two hypothetical particles to be particle and antiparticle, we would have to have: $sgn(\alpha_n) = -sgn(\sigma)$. So while their base probabilities would cancel out due to the synchronization field (i.e. electromagnetic force in standard physics?) and they would attract themselves to the point they annihilate one another (see Conjecture 3 on Sync-Based Attraction) there would still be a fluctuation in the

probabilistic field, generated by the $abs(\alpha_n) - abs(\sigma_n)$ difference, which I will call *opposition*. I will consider opposition quantifiable as a range (hence the supposition there are multiple types of antimatter, with varying degrees of energies that should result from annihilation with matter).

In Appendix 6 I showed why σ_n has to be increasing to account for the probabilistic behaviour at infinity - but it only has to be globally increasing, across its entire domain. Therefore it might be possible for values of σ to be negative in limited pockets (as exemplified in the chart below) - hence the scarcity of antimatter.



An exemplification of how σ might allow negative values for bias (and therefore the limited existence of antimatter)¹²⁸

¹²⁸ The match between theoretical possibility and the tangible, provable scarcity of antimatter suggest that the bias function is not a universal constant but is rather governed by quantum uncertainty (within certain inescapable global restraints).

Archimedes: "Give me a place to stand..."

An early precursor to Relativity?

There are many versions of this Archimedes' quote, each with maybe a couple of different words when compared, but one of the most known versions is: "Give me a place to stand on and I will move the Earth". This can be interpreted not only as a statement referring to levers but also as an allusion to the fact that there is no fixed "place to stand on". Everything is in motion. Archimedes might have caught on to this from the spatial perspective. Einstein or any other modern relativity theory is probably looking at it from the space-time perspective. It's interesting to see how, as our scientific perception evolves, the rules that describe our universe become more and more generic. Both Archimedes' fixed point and Einstein's relativity could be interpreted, in the context of the probabilistic model of the universe, as stemming from the same cause of entropy / uncertainty permeating (and originating) the universe, i.e. truths absolute to the entire universe might simply not exist and everything is relative at a universal scale.

Consciousness vs. Probability

Throughout this book I referred to individual collapses from the probabilistic tree as quantifiable with a certain amount of consciousness and with a certain probability of occurrence. As you've read through the chapters you probably understand the claim that electrons, protons, neutrons have a high(er) probability of existence than other, more exotic particles and this, in very broad terms, explains why the observable universe is composed by these particles. For elementary¹²⁹ particles, consciousness and probability might even be quantifiable as equal. However, the functions that quantify collective consciousness vs. collective probability (including for familiar macroscopic entities like humans) are:

- Synchronization¹³⁰, for collective consciousness;
- A function of multiplication, not yet detailed in this theory, for collective probability.

In other words, this explains why elementary consciousness is additive via synchronization and adds up to bigger values (i.e. we're smarter than

¹²⁹ Each individual collapse in the probabilistic tree, at the mathematical level; much below currently known quantum and microscopic levels.

¹³⁰ See chapters 2 and 3 for details on Synchronization



the particles that compose us) but why the probability of living beings emerging from these elementary particles is actually smaller than the probability of any one of these particles (that could potentially compose us) to exist - multiplication of values smaller than 1 will of course result in a value smaller than any one factor.
The End

The likelihood that you have reached the end of this book has informed my action, ahead of time, to mark the end of the book here. I have in fact answered your yet unasked question: "Have I reached the end of the book?". To those that skipped ahead or are merely peeking, this was a witty reference to the topic of answer preceding question, touched-upon throughout these pages.

If there is any message I'd like to end with (beyond my hope that there will at least be *some* scientific benefit from the theory I've presented): what you hold before you opens up the universe to an infinite number of possibilities; and whatever you do to stay in sync with the universe: It all adds up.



Bibliography, References, Recommended Reading

In order of appearance or recommendation:

[1] Conway, John H., and Simon Cochen. "The Strong Free Will Theorem." Notices of The AMS 56.2 (2009): 226-226. https://www.ams.org/notices/200902/rtx090200226p.pdf

[2] Istrail Laboratory. "John Conway - The Game Of Life and Set Theory" <u>https://www.youtube.com/watch?v=cQUAwhhC8cU</u>

Afterword

This book is not a work of fiction. It's a scientific proposal that I make to the best of my abilities, selflessly and in good faith. Also, this book is not a doctor or a magician - even if the universe has a mathematical nature we are still bound to the physical laws that we are bound to. After Isaac Newton conceived his laws, he didn't instantaneously start to fly. It took hundreds of years for someone to build a plane. As Morpheus said in The Matrix, "there's a difference between knowing the path and walking the path". I hope that the beginning of the 3rd millennium produces *some* catalyst, whether it's a theory such as this or another, for a scientific and spiritual paradigm shift / unification into the study of consciousness. If this book informs your research or inspires you in some way, please let me know, I would be very curious to find out. To place this theory in a contemporary context, one could say that the probabilistic origin of the universe is in line with the Many-Worlds interpretation of quantum mechanics, and, actually, I think it gives the Many-Worlds interpretation a framework - but it is so much more than this. I intended it to be a cosmological model, as suggested on the cover, but I think it amounts to a comprehensive metaphysical journey. It sustains the already existing idea that we are all the same consciousness inhabiting different containers and configurations in different quantities and that the elements that compose the universe are conscious themselves albeit infinitesimal. The entire theory that i've tried to present within this book makes sense in my head; I only hope that a software engineer¹³¹, such as myself, with only amateur-like affinities for quantum

¹³¹ The fact that I'm a software engineer also gives me, perhaps, the advantage of being open to perceive nature's greedy algorithms. Beyond its beauty and diversity,

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physics / mechanics and set theory, can decently transmit / formulate a hypothesis describing probabilistic origin. If this is not the case, however, please let me know where you think things don't add up and feel free to make suggestions¹³² - I would also like for this book to be a catalyst for working together¹³³.

A few behind the scenes facts that you might be interested in:

- my favorite chapter is *The Arrow Of Time*; I still remember the (final¹³⁴) revelation that prompted me to start writing: the idea that the entire space-time is pre-generated and it's only the progression of my memory through it that gives the sensation of a steady, directional time-flow;
- I thought I had it all figured out, until I had to explain gravitation in the probabilistic universe. That was one of the biggest challenges, but the realization that the problem can be reduced to factorization happened in a *Eureka* moment...

I wish to acknowledge my: parents & family, friends, colleagues, neighbors for their support, not just for this book but for me in general. I also want to acknowledge: Albert Einstein, Nikola Tesla and John Horton Conway (as scientific beacons), Edgar Dean Mitchell (who, in addition to being the 6th man on the moon, was one of those at the public forefront of uniting the study of consciousness with the study of the quantum phenomenon - a topic where I feel David Bohm also has to be acknowledged) and Leonard Nimoy for being the science officer of our imagination and for *bringing spiritual feeling and scientific aspiration together* in a way that few others could - perhaps *exactly what we need* at the dawn of this new era.

the universe is not so complex and behaves in simple, efficient, even predictable manners.

¹³² There will, for sure, be future, revised and enriched editions of this book.

¹³³ The feeling of a few may rightfully become the feeling of many, in support of a unified view of our common reality.

¹³⁴ There were more than one.

Improvements to this book over time:

2023:

• Bibliography / Recommended reading (including youtube videos)

2019:

- Improved formatting;
- Additional footnotes and explanations;
- A new appendix: "Drake's Equation vs. the Fermi Paradox";
- A new appendix on Antimatter (and why it "lost" to Matter);
- A new appendix on Archimedes' "fixed point";
- A new appendix on the differences (and similarities) between the quantifications of consciousness vs. probability;
- New chapter (Chapter 15) of interpretations and conclusions for the entire theory



NOTES
