Knowledge Seeker

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Abstract

Special first inaugural issue of *Knowledge Seeker*, a journal focused on Fundamental Questions. High-quality peer-reviewed research at the intersection of physics, computer science and philosophy.

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Welcome to the *Knowledge Seeker*, a journal focused on Fundamental Questions. Knowledge Seeker goal is to publish high-quality peer-reviewed research at the intersection of physics, computer science and philosophy.

Our promise is to be a no-nonsense journal: no formalities, no lengthy processes, no hidden fees, no red taping, no elitism. Knowledge Seeker is a next-generation journal, simply laser-focused on delivering high-quality content.

Knowledge Seeker is particularly keen on publishing:

- Head-on answers to Fundamental Questions.
- Bold ideas that make us rethink an area from scratch.
- Works opening completely new areas of inquiry.

This is a special first inaugural issue featuring an article from the editor-in-chief.

On Only Nothing Existing

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Abstract

Why is there something rather than nothing? About this storied question we challenge the commonly accepted main assumption: the existence of something. Starting from Nothing only, we explain how our perceived reality emerges as an illusory self-referential interpretation of Nothing and build a framework to give precise definitions to fundamental concepts such as existence, reality, nothingness and somethingness. We then explore the consequences of this framework and we discover an explanation for the existence of laws of physics in our illusory reality. By aiming to describe reality starting with Nothing, we provide the first instance of an assumption-less theory.

0.1. Introduction

Why does anything exist at all? Why not nothing? This question has been asked many times in the past and has been dubbed "the fundamental question of metaphysics" [Heidegger, 2000]. Among thinkers that do not consider this question ill-posed, multiple classes of explanations have been proposed over the years, including:

- God
- Nothing is an absurd state
- Something just is, by brute fact
- The existence of a necessary being
- Infinite recess

To hope to get closer to a meaningful answer, one may be interested in figuring out what is truly fundamental, what entities ground anything else. Once this elite set of entities is understood, it should be perhaps possible to understand why such entities must exist. In the language of physics, we are asking what is the least possible number of assumptions we can use to create a theory describing our universe.

Motivated by these questions we explore the limits of what can be described when many of the entities we usually assume are removed. Bringing this limit process to the extreme, we are left with Nothing, a state where no things are present. Here we are not talking about a "physicist's Nothing" (the quantum vacuum) but about absolute Nothingness, a "Philosopher's Nothing". The (bold) claim of this paper is that this should not be seen as a dead end, but rather a consistent theory of our reality, if one is ready to make a leap into an uncomfortable truth: only Nothing exists. If this is correct, our experiences and our reality are an illusion, albeit a coherent one.

Any such statement should evoke an incredulous stare and demand for an explanation on how an apparent something can even arise out of Nothing. We do just that, in the context of a string representation built out of "Nothing building blocks": we show how observers arise and how their limited observation power makes the experience convincing and we explain in what sense the transition Nothing to something happens. We then explore the necessity of this argument.

Finally, we explore the role of universe-simulators such as computers in describing our reality, which allows us to draw conclusions on the existence of regularities and laws of physics in our universe.

The main contribution of this paper are the following:

1. We answer negatively to why anything exists at all, arguing that Nothing exists, and we explain how this is compatible with our observations.
2. We give a mathematical framework to define and use concepts such as existence, somethingness, nothingness.
3. Equipped with such a framework we explain why the laws of physics are present in our reality.

4. By aiming to describe reality starting with Nothing, we provide the first instance of an assumption-less theory. For instance we do not assume concepts such as mathematical entities, logic, probability, space-time or abstract entities among all the others.

The main inspiration behind this work comes from the latest development in theoretical physics, especially quantum gravity, where the role of space and time is increasingly seen as emergent from a more fundamental timeless theory. This progressive erosion of fundamental concepts leads to the idea of reality being describable as a static structure. That said, no knowledge of these areas will be required to understand the core arguments of this paper. The reader may benefit from being familiar with basic notions of computer science, information theory and algorithmic information theory.

0.2. Related Work

Why something rather than Nothing has been extensively discussed over the centuries, with many authors taking a stance on Nothing and Nothingness.

Authors disqualifying Nothing as a valid option include [Leibniz and Leibniz, 1989], Parmenides ("nothing can be created out of nothing"), [Nozick, 1981], [Van Inwagen and Lowe, 1996], [Coggins and Coggins, 2010], [Beebee, 2004], [Bennett, 1980], [Brenner, 2016], [Carlson and Olsson, 2001].

Authors considering Nothing as a valid option include [Baldwin, 1996], [Armstrong, 2004], [Rodriguez-Pereyra, 1997], Gorgia ("Nothing Exists").

Finally many authors consider the question ill-posed: [Grünbaum, 2004], [Maitzen, 2012], [Heylen, 2017].

Other pedagogical works related to existence and why something rather than nothing include [Quine et al., 1948], [Witherall, 2001], [Hegel, 2014], [Kuhn, 2013], Hegel in Science of Logic, [Resch, 2021], [Brenner, 2022]. Of course the references in this section are just a minuscule subset of all the works on the topic and they cannot make justice to all the thinkers that worked on the problem.

0.3. Main Results

0.3.1 An Assumption-Less Theory

Answering why there is something rather than nothing is deeply tied to understanding what is fundamental, since it allows us to focus our investigation on a few entities. First of all, what do we mean by fundamental entities? The concept of fundamental is a relative attribute between two entities and it is closely related to the concept of grounding or ontological dependence. An entity B is less fundamental than an entity A, or equivalently entity B is grounded by entity A, if the existence of entity B is dependent on the existence of entity A. For instance a mosaic is grounded by the small stones it is made of: without the stones there is no mosaic. Notice how no notion of causation is implied in the concept of grounding, there is no need to introduce time or actions between entities.

Historical trends in theoretical physics have seen theories explaining our universe with increasing levels of simplicity, by unifying different quantities into underlying more fundamental entities and laws. From the fields of quantum theory to the space time in general relativity, few pages of text would suffice to describe the vast majority of phenomena we experience. In this work we want to continue on this trend and bring it to

the extreme, investigating how far we can go in describing our universe with a minimal set of assumptions. This should supposedly shed light on why something rather than nothing: since any assumption is describing something, we may be able to justify that postulating the existence of something is an unavoidable state of affairs.

We shall begin by considering the current theories of physics and progressively eliminating entities and assumptions from our picture of reality. In the following we will use the words reality and universe as synonyms.

To start, it is not hard to imagine unifying gravity and quantum theories into a more fundamental quantum theory of gravity, indeed many proposals have been made for such a theory. In this theory few fundamental entities will describe any physical process happening in the universe.

But let's go further, beyond purely physical concepts. We can then take a nominalist view of reality, saying that abstract entities do not exist, and are simply labels that we give to material entities. In a similar vein, mathematics and physical theories do not exist, they are simply symbols we use to speak about the physical universe. Ultimately these symbols are patterns of information encoded in our brain, which themselves are specific configurations of the neurons or other smaller constituents of our physical bodies. Mathematical theories and entities not existing include logic, numbers, relations, falsehood and truth.

In line with a materialistic view of reality, the physical constituents of our bodies and the universe can be assumed to be everything that exists. Therefore the mind or the consciousness are emergent patterns from the more fundamental components of our body.

So only physical components remain. We will keep using mathematical theories to describe them, but this description should not be confused with the universe itself they describe. As a further step, we can consider time and space to be non-fundamental. Indeed one can see space and time as emergent properties of a more fundamental purely quantum theory, in which the quantum fields are all that exists. One can then describe the universe given these fundamental fields.

One could then remove these fields and any concept of relations and separation between them, remaining with a monistic view of reality, in which the single remaining entity, the background, is in fact the whole universe. We shall now remove this entity.

It would seem that now very little is left to build a universe with, but one could still imagine an objective probability distribution of something happening being present. Let us now consider a theory in which there is no notion of probability, randomness or any sort of possibility. No causation, no time, no space, no entities, no potential for any entity to be present.

In case anything else unaccounted for is present, we will remove it. The order in which we removed entities is not really important, any order will do.

Where have we arrived? What is left? By definition, we are left with Nothing, the result of removing any instance of something [1]. In this theory nothing exists, or equivalently: only Nothing exists. Trying to also remove Nothing is pointless, there is nothing to remove in the first place. So we can say that our theory has no assumptions, or equivalently that our theory is assuming only Nothing. Notice how an assumption-less theory is unique: any theory with no assumptions is equivalent to the theory we are describing.

This seems like a dead end for a predictive theory. We went too far in our quest to remove assumptions and it seems now impossible to get anything meaningful out of

[1]We will use a capital N to distinguish Nothing from the common usage of the word nothing

Nothing, let alone our whole universe. Since we made no assumptions at all, there is no mechanism able to give us something out of Nothing.

Yet, this raises an interesting possibility. There is no need to get something out of Nothing if nothing exists. If our reality does not exist, there is nothing to generate out of Nothing, or nothing needed to exist to explain it. But we certainly seem to exist.

In the next section we will explain how our perceived reality appear to emerge as an illusory self-referential interpretation of Nothing, implying that an assumption-less theory may be the true fundamental description of our reality. In other terms, our reality is grounded by Nothing. In the following sections we will conveniently refer to this theory as N-theory ("N" stands for Nothing) [2].

Notice that attempts to knock down the exclusive existence of Nothing with the metaphysical equivalent of the liar paradox ("Nothing exists" as a proposition is something, so there cannot be only Nothing) are unsuccessful, since we are claiming that ontologically nothing exists (including propositions, logic, descriptions, etc.) and in any case the description we use for Nothing is a separated concept from Nothing itself. See for instance [Westerhoff, 2024] for a deeper explanation.

0.3.2 Out of Nothing

First of all, what do we mean by "our reality does not exist"? We certainly do experience it, all the time! To understand the meaning, let's consider Santa Claus's reality. It is a well known fact (in adult age) that Santa Claus does not exist, yet we can clearly imagine Santa Claus's reality, a reality where Santa Claus does exist and uses magic to bring presents around the world. We can for instance imagine Santa Claus contemplating the obviousness that his reality exists, unaware of being inside a fictional reality that we created. The claim of this paper is that we are Santa Claus, as we live in a fictional reality. Where this analogy breaks down is when considering who "creates" the fictional reality, or equivalently what is the substrate of reality. Santa Claus's reality is a shared mental pattern of the human species. Instead our reality (or the tower of realities below us) is a pattern ultimately grounded by Nothing.

A pattern in what? And who observes the pattern? That is, how does our reality emerge from Nothing? To understand it, take Nothing and without loss of generality let's label it with the 1-character string

$$0 \tag{1}$$

Notice how in N-theory "take" has no fundamental meaning, there is no passage of time, the symbol 0 does not exist and so on; but let's pretend this is possible for now, we will relax this assumption later and we will give a more formal explanation of these concepts. Right now let's focus on an intuitive understanding of the emergence of our reality. We can define the string 00 as representing the addition of Nothing to itself, but since adding Nothing to itself still gives Nothing by definition we have

$$0 = 00 \tag{2}$$

, where the equal sign indicates that the two strings represent the same underlying object. For simplicity let's now label 00 with 1, so

[2] Credits to Jason Resch for the captivating suggestion of "ø-theory" as an alternative name.

$$00 = 1 \tag{3}$$

This of course implies

$$0 = 1 \tag{4}$$

What we are really doing is just relabelling Nothing. Similarly $0 = 00 = 000 = 0000\ldots$ where the latter is an arbitrary long string of zeros, which using 1 here and there we can write as

$$0 = 0100111001101111011101000110100001101001011011100110011 1\ldots \tag{5}$$

where the arbitrary string on the right can be arbitrarily long.

If we now focus on the long binary string, we will find patterns that we can interpret. If we assume that all strings are possible, armed with enough patience there will be substrings where we can find the encoding of a computer, that is those substrings do represent a computer in our language of choice. For instance we could find a substring with the definition of a Turing Machine, an abstract model of computation that represents a computer as a device able to manipulate symbols on a tape based on some rules. Glossing on the details, it is possible to represent computer "hardware" and software into a string. If we look long enough eventually we will spot a string with the encoding of a running computer program with our reality as an output, including human observers seeing and experiencing our universe, together with mathematics, eyes, brains, language and everything else we use to explore it.

This is our reality: a string. But deep down it is a trivial string, equating every symbol and every possible combination of symbols to 0. We never moved from the starting position, that is Nothing.

It's worth to slow down and recap what "happened" here:

1. Only Nothing Exists.

2. We defined some symbols grounded by Nothing and built a string out of those symbols, by operating on them. These symbols, the concept of a string, operations on symbols, etc. do not exist at step 1, but surprisingly appeared here at step 2 nonetheless.

3. The complexity of the string grew enough to find patterns into it, as defined by some encoding of our choice. In fact inside those patterns we found a pattern able to describe us, our languages and our universe.

4. Given our universe and the languages and formalisms we use to describe it, we now have all the concepts which we surprisingly encountered in step 2, which justify how we "transitioned" from step 1 to step 2 in the first place: all the concepts are grounded by Nothing.

Notice that the steps above are not in chronological or causal order, as the concept of time emerges somewhere in the string describing our universe.

Some words about the encoding of our reality into a string and implied assumptions:

- The symbol "0" itself has only meaning inside our apparent reality. There is nothing special about this symbol, or any other symbol.

- There is nothing specific about the encoding of the string or the fact that we found our reality encoded as a computer program, it is simply a convenient way to find our reality out of Nothing, but it is not the only way. Another way for instance would be to encode our reality "directly", by using a dictionary matching substrings to elementary particles and laws of physics. A further way would be using bits to encode some fundamental entities of a space&time-less physical theory describing reality as a static string.

- Who chooses the encoding? We choose it by interpreting the string that makes us in a language that we are familiar with (mathematics, computer code, english language, etc.) of our choice. The encoding is not a property of the string itself, it is observer-dependent.

- We are assuming that the experience of reality is substrate independent, that is similarly to bits of information the building blocks of reality can be implemented on arbitrary substrates.

- Any mechanism using a single building block (e.g. Nothing), some functions acting on the building block and an arbitrary encoding to build a representation of our reality will lead to similar results to N-theory. The mechanism we used with strings of 0s and 1s (conveniently connecting with familiar notions of computer science) is an instance of it. Some readers may be more familiar with the set theoretic constructions of the natural numbers starting from the empty set, and then postulating that mathematics is fundamental and can reconstruct reality. In any case choosing Nothing as a building block and a string as representation has advantages of parsimony and expressibility respectively, as we will see later.

0.3.3 The meaning of Nothing to something

Does the transition Nothing to something, let alone Nothing to our reality, ever truly happen? Does step 1 ever lead to step 2? The answer is no. The transition Nothing to something never really happens, it is just our interpretation of how we came to be. We did not come to be at the most fundamental level, since there is no mechanism for it starting from Nothing. The transition is a metaphor using terms and notation from our reality. As a corollary, N-theory is part of our fictional reality too and does not have any fundamental status.

One may still argue that the denial of any mechanism for the transition undercuts the possibility of explaining how our reality emerges from Nothing, even as an illusion. If there is no mechanism, how can there be even an illusion of something? Firstly, there is no need for any genuine mechanism, an illusory mechanism is enough to generate the illusion. Secondly, the illusion itself does not exist. The illusion of creation from Nothing is only credible in the context of the illusory reality.

Coming back to the Santa Claus world analogy, the fundamental building blocks of Santa's world exist outside of their world (the neural patterns in our brains, the hard disk of a computer, etc.). In a sense, those building blocks have no Santa-reality-existence. But at least those building blocks exist in the lower level reality, our reality. In a similar fashion our reality building blocks are outside, but with much more dramatic characteristics: they have no existence attributes at all and they have no somethingness. Here we assumed our reality to be a "level 0" of a chain of illusory realities, but the argument doesn't really change if this is not true: there is going to be a level 0, which is grounded by Nothing.

In summary, out of Nothing it is possible to have an illusion, an entity which fundamentally does not exist, self-referentially explaining to itself how it came out of Nothing.

0.3.4 Strings of Nothing

We argued that strings of Nothing building blocks are a convenient representation, as opposed to directly presenting the realities they encode. In this and in the next chapter we will further show why this is the case.

How many strings are there? All of them. More precisely, all the finite and infinite strings over the binary alphabet can be generated (in computer science lingo, respectively the Kleene star Σ^* and the Σ^ω, that is Σ^∞). In the absence of any cost (including time) to add a symbol, all the strings indeed will be generated with no exception. Or equivalently, if a particular illusion is possible, all possible illusions should be possible too.

Now, it may seem paradoxical that an infinite amount of information can be extracted from Nothing, but actually there is no contradiction since a set containing all possible combinations contains no information: there is only one microstate associated with the macrostate of the system, and no uncertainty about it. There is only one state associated with it, which is the state of all the possible combinations of symbols. This is similar to the information content of the Borges's library of Babel or the digit-strings found in the digits of the number pi, which is conjectured to be a normal number. Yet, a lucky observer experiencing a particularly meaningfully ordered room of the library of Babel may be under the erroneous impression that the whole has meaning [3].

This is exactly what is happening to us: being part of one of the strings we are limited in our appreciation of the set of all strings, and we are tricked into seeing something meaningful.

All possible strings exist, they represent physically separated universes and have the same status. Some strings are infinite, so they may contain multiple physical universes each. For each string there are an infinite number of strings differing just slightly (say 1 single bit) from that string. The existence of all possible strings is reminiscent of modal realism, in which all possible worlds exist, are causally separated and are as real as our world. Some core differences between strings and worlds are that strings are far from being irreducible and more importantly that the strings are only meta-existent (only Nothing exists). Speaking of existence, we can now use the string formalism to define important concepts such as Nothing, Something and existence.

0.3.5 Definition of something and nothing, existence

Here we present some definitions together with the intuitive understanding behind the definition (the latter should not be taken literally).

- Definition: *Somethingness*, $S : s \to \mathbb{N}$, $S(s) = l - 1$, where l is the length of the string s. So $S(1) = 1 = S(00)$, while $S(0) = 0$.

  Intuition: Long strings tend to have many properties (substring defined as properties), indeed high somethingness objects can be characterised in many ways.

- Definition: *Something*, s such that $S(s) > 0$.

[3] In the case of the Babel library this is not technically correct, since the books in the story have finite length.

Intuition: A blob with some features, where the features are defined by some language defined on the blob itself.

- Definition: *Nothing*, s such that $S(s) = 0$.

  Intuition: A blob with no features and without the blob. In the string notation Nothing is 0.

- Definition: *s-existence (or string-reality)*, $sE : t, s \to \{0, 1\}$, equal to 1 if the substring t is in the string s, and 0 otherwise.

  Intuition: An object s-exists if the object can be found inside such a universe.

- Definition: *u-existence (or universal-reality)*, $uE : t, \Sigma^\infty \to [0, 1]$, $uE(s) = 2^{-(l-1)} = 2^{-S(s)}$

  Intuition: Objects which can be found often and inside a large number of universes (strings) are more fundamental.

- Definition: Being *real*, $u(E(t)) = sup(uE(s))$ for all possible s, where sup is the supremum.

  Intuition: A fundamental object is an object existing in the largest amount of strings.

- Definition: Being *meta-real*, $u(E(t)) < sup(uE(s))$ for all possible s.

  Intuition: A non fundamental object.

This string representation helps us conceptualize the transition from Nothing to something: things can "borrow" $0s$ and $1s$ to establish themselves, by giving up on being real and existing at the core level. Only Nothing is real, having the highest possible universal-reality value. Somethingness is inversely correlated to u-existence: long strings exist in a smaller region of the string space Σ^∞.

0.3.6 On Something existing instead

Can something exist? Said differently, is the lone existence of nothing we discussed necessary?

Here we present 4 arguments in favour of the necessity. None turn out to be decisive for similar reasons.

1. A system built out of Nothing is the only system which can prove its consistency without assuming axioms. Here by consistency we have in mind the mathematical consistency of a physical theory. Indeed a Something system cannot normally prove its consistency without ad hoc axioms or if sufficiently complex it cannot completely describe itself from the inside (see for instance second incompleteness theorem in logic), but this is possible in the case of Nothing, since the whole is equal to the system to be proven, to the inside and the outside (there is nothing to prove!) [4].

[4]One could argue that Something may pass those consistency checks, after all one could relabel Nothing as Something. In our string notation, Something = "0". But this is simply a semantic trick, which is contrary to any reasonable expectation we have on Something, that is not to behave as Nothing by definition.

The trouble with this argument is that while a well-behaved theory of Something should satisfy consistency requirements, Something itself may not require the need for a mathematical description or consistency, similarly to how Nothing doesn't.

2. Nothing is stable against any action or relation, including the "removal of", "the absence of" and the "transformation into". All of these simply map to Nothing itself. But a similar critique to the above applies.

3. Let's assume that something does exist. One could for instance imagine the whole universe existing as a brute fact or a single entity existing and giving rise to our experience in a similar fashion to N-theory, but with S in place of N. Even though such a theory can explain our experience, we just showed a similar theory which achieves the same result, but with fewer assumptions (namely not assuming the existence of something). Making use of parsimony arguments (Occam's Razor) one must conclude that everything else being equal we should favor the explanation using less assumptions, therefore we should conclude that only Nothing exists. Yet, Occam's Razor has significance in our perceived reality, in which the concept of parsimony can be defined. So ultimately we cannot invoke this principle to discriminate against the possibility of something existing instead.

4. Another argument can be made about the uniqueness of Nothing, given its featureless nature. Something by definition must have some feature, which implies more than one possibility for the feature and possibly the absence of it. But again, the preference for a theory with a unique configuration (with no adjustable parameters) is a bias of our perceived reality, not of the fundamental reality.

In conclusion, we argued that even though our experience can be reconstructed from Nothing only, something may exist after all. So proving the necessity of N-theory seems too much to ask, even though this is not a definitive argument.

So how should we approach the two competing alternatives (Nothing Exists vs something exists) as candidate theories explaining our universe? When comparing them it seems suited to do what we would do with any two physical theories leading to compatible predictions: select based on parsimony the theory with less assumptions. Even though parsimony cannot be used to prove the necessity of a theory, it can be used to flag which theory is more pragmatic. Oftentimes in using a parsimony principle it is not only the number of assumptions itself, but the complexity of the assumptions that might be a factor. In this case Nothing existing is a superior alternative in light of parsimony both with respect to the number of assumptions and with respect to any conceivable notion of assumption complexity.

In closing, using parsimony it is more economical to conclude that nothing exists after all.

0.4. Discussion

In this section we discuss various aspects and consequences of N-theory.

0.4.1 On the existence of the laws of physics

From N-theory one can derive the existence of the laws of physics in our apparent universe [5]. To understand how, firstly let's notice that the essence of the law of physics boils down to the presence of order in our universe. There exist repeatable processes, following the same patterns, as opposed to a chaotic universe in which the outcome of the same experiment can give different results.

At a first glance it may seem that N-theory could indicate the exact opposite of order, indeed all possible strings are present, including gibberish universes. Even if we employ an anthropic argument to filter only the strings that feature enough order and complexity to sustain our experience there is a vast amount of universes identical to our universe in which the laws of physics do not exist. In some of those universes a ball left in mid air will fall, in others it will go up, in others it will explode without reason. In fact these gibberish universes vastly outnumber well-behaved universes due to combinatorics.

A key question now arises: how is our universe encoded in the string? A naive way to encode our universe is to do it directly: encode every single elementary particle and relationship between them and let them evolve. But there is a much more compact way of encoding our universe, which is to encode a computer simulating our universe. These computers are more likely to generate our ordered experience, indeed it is a well known fact that computer induced distributions on random inputs favor simple strings over complex strings for a given output string length.

The typical example here is taking a monkey and tasking it to write the entire work of Shakespeare, which we assume to be 1 million bits long. The monkey will simply press keys at random. If we give the monkey a typewriter, the monkey will manage to reproduce it with probability $P \approx 2^{-10^6}$. But if we give the monkey a computer, the computer will take the randomly written monkey keyboard input as a computer program and let the computer program perform the output. The probability of printing a string x given a random input is equal to the universal probability [Thomas and Joy, 2006]

$$P_U(x) = \sum_{p:U(p)=x} 2^{-l(p)} \tag{6}$$

where p is a program randomly drawn as a sequence input bits, U is a computer and $l(p)$ is the lenght of the program. One can show that [Thomas and Joy, 2006]

$$P_U(x) \approx 2^{-K(x)} \tag{7}$$

where K is the Kolmogorov Complexity, that is the length of the shortest computer program outputting x. Given the compressibility of the english text, one can approximate $K(Shakespeare) = 250000$, so $P \approx 2^{-2\,5\cdot 10^5}$, which is incredibly more likely than obtaining Shakespeare from the typewriter monkey.

So we reach some interesting conclusions:

∗ Simulated universes are more compact, so they are more u-existent.

∗ We are likely to be simulated, rather than encoded "directly". (here and in the following "likely" is synonym of being more u-existent)

[5] In fact this is not specific to N-theory, the key is being able to generate any arbitrary strings or having a probability distribution over all possible realities and having a bias over more compact strings or realities.

∗ If we interpret the computer program code as the laws of physics, we are then likely to be in a universe with laws of physics.

The simulations we are considering are different from the ancestor-kind simulations [Bostrom, 2003] in which the simulators are conscious entities; we are instead considering randomly instantiated computer simulations. While ancestor simulations can be shown to be unlikely under reasonable assumptions [Pieri, 2021], here we argued that random simulations heavily outnumber non simulated realities.

It's worth stressing that there is nothing special about computers, any reality simulator would do, where by simulator we mean a system able to simulate another system with less complexity/resources than the simulated system. But computers happen to be well understood and practical, as opposed to simulators such as dreaming brains, brains-in-a-vat, and so on, so we will restrict to them.

0.4.2 On Science, Quantum Gravity and the Theory of Everything

In light of N-theory, how can we interpret the quest for a theory of quantum gravity, or of a Theory of Everything (ToE)? The traditional view of finding a mathematical theory able to explain all the physical phenomena present in our universe can be seen at the search for the encoding of the computer program running our universe.

What is science in N-theory? Traditionally science can be seen as the paradigm of creating a theory, performing an experiment and measuring the results. Since we have only access to the strings in which we are s-existent, science is the study of the strings in which our universe s-exists. In fact it is only the study of the substrings in which our universe is encoded.

The larger Σ^∞ space of all strings seems inaccessible to science. The good news is that we are present in almost all the space (a finite string has mathematical measure 1 in the set of all possible infinite binary strings). The final boundary of science seems to be to figure out the shortest program compatible with our universe, which perhaps deserves the name of *Final Theory of Everything*. Indeed even though different computer programs can give rise to the same universe, the shortest encoding is not merely more aesthetically pleasing, it is more u-existent. [6]

One could hope to then answer a further question: why these laws of physics? Or equivalently, why this universe? Indeed one could hope that our universe is simulated by a program with a very special length: the length of the shortest computer program capable of simulating an observer experiencing a universe, which we call L_{sso}. While there are other important lengths such as the shortest computer program capable of simulating self-aware entities, self-replicating entities or life, simulating an observer seems to be the minimum required to have a pattern in the string which can unequivocally relate to our experience. Indeed our experience of the universe may be apparent on multiple levels, buried under a tower of simulations, but it requires experiencing the universe in the first place. If our universe can be simulated with a program of length L_{sso}, that would

[6] Of course one could give up on the usual computer programming definitions and choose a trivial encoding in which our whole universe is encoded in a very short string, or even a single character, but this would be pointless for the sake of extracting predictions for our universe. We will not enter into technicalities about the choice of the encoding chosen to represent the strings, similarly to how Kolmogorov complexities (length of the shortest program associated to a given string) are relative to the chosen language but the overhead for changing language is bounded.

make our universe more u-existent than any other universe, perhaps explaining why these physics laws and not others.

0.5. Conclusions

We argued how starting purely from Nothing one can obtain a consistent description of how our reality emerges, grounded by Nothing, where the consistency is from the perspective of us observing the universe. We argued that these observations are illusory, a self-referential manifestation of Nothing, since fundamentally Nothing exists. We labelled this assumption-less theory N-theory.

We argued for N-theory to be a possible explanation for our observations and therefore to be the preferred explanation in light of parsimony. We outlined some unsuccessful attempts to argue for the necessity of this result. It is an open issue to establish if a necessary argument can be ruled out altogether or if necessity can be established.

We introduced precise definitions of concepts such as Nothing, Something and existence, based on a description in terms of binary string encoding grounded by Nothing. Such encoding is not unique, but it is useful thanks to the familiarity of this encoding in the context of computer science. It is an interesting question to ask if different strings encoding or different representations altogether can lead to further insights.

No attempt is made in this work to discuss morality and the right reaction to this "ultimate nihilistic" viewpoint, but it is certainly not the author's intention to imply that we should not live to the fullest in our reality (apparent or not).

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Closing Remarks

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