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The Unit Theory

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1. An introduction, concerning the origin of the cosmos

2.

I am sitting by the table, contemplating on philosophical theories concerning the origin of the cosmos. Although I tried to convince myself that there must be one plausible theory among them, none of these theories could hold its ground when confronting my doubts.For the purpose of clarity, I will use terms as "thing" and "being" indifferently simply referring some existence in the cosmos. This includes physical existence, ideas and phenomena.

To begin with, I looked at the cosmological theory. This school is championed by Descartes, who in the third meditation of his *Meditations on First Philosophy*, argues the following points. Descartes believes that "something cannot arise from nothing", thus everything must have a cause. Furthermore, this cause here must contain more formal reality, as he argues "Now, it is manifest by the natural light that there must at least be as much formal reality in the cause as in its effect; for whence can the effect draw its reality if not from its cause ?[1]" Here formal reality means existence. Since it is not possible to compare the existence of a being to the existence of another being in terms of extent (to exist is a binary operation that only returns discrete value of true(1) and false (0), not an extent, which lies within a continuous array of (0,1)), what Descartes suggests shall then apply to sets. That is, to compare the reality of a cause with its effect is to compare the number of occurrences of beings that are contained in

[1]Meditation on the first philosophy

the cause with the number of occurrences of beings in total , and Descartes claims that the reality of the cause is at least as great as the reality of the effect. However, this claim is somewhat problematic. To elaborate a little on this point, assume the contrary, that there is a causal relationship between A and B, where A and B are sets of beings, and the number of occurrence of beings in A is smaller than the number of occurrence of being in B. Descartes claims that this scenario is impossible, for that there will be certain beings in B that are not caused by anything in A. But this would imply causality being a one to one and onto (injective and surjective—a bijective relationship) relationship. To be more specific, assume set A ={a, b, c} and B = {w, x, y, z}. Since A (sufficiently and necessarily) causes B, we can find a mapping f from A onto B, and f(a)=w, f(b)=x, f(c)=y. Now it seems that z in B has no cause in A, which Descartes perceives as a contradiction, which will make our assumption false. However, this is not necessarily the case, for z can still be caused by any elements in A. This would only make a being in A causes more than one being in B, but this is hardly a problem. For example, if I eat an apple, this act would have at least two effects, that the apple ceases its existence, and my hunger ceases its existence. Therefore, there is no necessary contradiction when assuming the contrary, and Descartes's resulting claim that "something would arise from nothing" will not necessarily hold.

However, even if we abandon Descartes's argument on different levels of reality in effects and causes, there are still some problems in Cosmological argument. As a thing must have its cause, its cause should also have a cause. Following this logic, we would end up with an infinite chain of causes. For any arbitrary being A there exists a being B such that B causes A. To settle this, a cosmologist shall either assume the infinity of the cosmos or assert a first cause. Aristotle, for example, suggests the latter, that there is a first mover, and this first mover starts this whole chain of causality. This is also echoed by Descartes, who claims "And although an idea may give rise to another idea, this regress cannot, nevertheless, be infinite; we must in the end reach a first idea.[2]"

However, since the rule that anything must have a cause is still valid, it is reasonable to ask what the cause of the first cause is. If we arbitrarily assert that the first cause has no cause and comes from nothing, then we would create an exception for our universal rule. This is rather a redundant tautology, as it simply asserts an origin of the cosmos without any supporting evidence. The first cause is true merely because we make it so. This involves a logical fallacy, and I will show it in the following example. If I assert the existence of an act that I eat an apple, as a consequence, we will have the existence of two effects, that the apple cease to exist, and that I no longer feel hungry. However, the act of me eating the apple is not verified but asserted. One only knows two facts, that the apple disappears and that I no longer feel hungry. But these two facts can be caused by something other than the act of me eating the apple. It could be the case that a pig eats the apple, and I eat the

[2] meditation

pig. There is no guarantee that the first cause that can results in the following effects is unique. This would allow a variety in first causes, but in that sense it is not the first cause anymore. Instead, what we have is an array of possible first causes. There can even exist possible causal relationship between these first causes, then how can one be certain which the actual first cause is?

One might then claim that there is still one fact remains unchanged, that is, the existence of the first cause (whatever it might be). But as stated previously, this first cause is asserted arbitrarily. The existence of the first cause that one may argue as being unaffected by the previous objection is merely a result of the act that we assert such. I can very well assert the existence of a triangle with four sides, but this will not make such triangle come into being. To protect this objection, Leibniz reinforces the Cosmological argument by introducing the law of sufficient reason, which he states as "no fact can be real or existing and no statement true without a sufficient reason for its being so and not otherwise[3]". Leibniz uses the principle to argue that the sufficient reason for the "series of things comprehended in the universe of creatures" must exist outside this series of contingencies (beings that either exist or not exist, which includes "creatures"), which is the first cause (he calls it God). But his argument is not that different from what we discussed previously. In Leibniz's theory, the first cause must exist because there is a sufficient reason for its existence. In this sense, the first cause is itself caused by its sufficient reason. Therefore this argument is simply a

[3] Monadology, §32

shift of the first cause and does not significantly differ from the original Cosmological argument: it is under the attack of objections raised above. In Leibniz's case, the sufficient reason of the existence of the first cause has two aspects, that we, as contingent creatures, understand the cosmos, and that the cause of contingent being cannot be a contingent being. Regardless of the question whether the first aspect of this sufficient reason is plausible, the second aspect is surely a mandatory assertion, making Leibniz's account also under the objection that we proposed at the beginning of this paragraph. Although Leibniz's attempt fails, he is in the correct direction. The argument of the first cause is extremely powerful, namely, whatever thing that one claims to be the basis of the cosmos, this thing necessarily becomes the first cause. To prevent the previously proposed objection, the only solution is to make such objection logically impossible, that is, impossible to ask for the cause of the first cause (or dismiss causality). This will be carefully discussed later.

As the first cause assumption has been properly refuted, I shall now examine the only alternative left in the Cosmological theory. This states that there is no first cause. Instead, there exists infinite number of beings, and these beings form an infinite chain of causality. This idea is originally proposed by Hume as a critique to the traditional Cosmological theory. However, this statement necessarily implies an unproved axiom that asserts the infinity of the cosmos. Nevertheless, this is neither provable nor refutable. For in order to show the cardinality of a set is infinite, we must show that for an arbitrary natural number selected, this set must contain a subset whose cardinality equals this selected natural number. That is to say, a set is infinite if and only if there is a bijection (1-1 and onto) relationship between this set and an infinite set. Therefore, to show our universe being infinite, we must show there is a bijective relationship between beings in the cosmos and elements in an infinite set. But now we would have a problem: in order to show the infinity of the cosmos, we must show the infinity of its corresponding set, and in order to show the infinity of the corresponding set, we must show the infinity of the corresponding set of the corresponding set. Again, this forms a chain similar to our causality chain, and it will have two consequences, that there is certain set asserted as being infinite, or this chain itself is infinite. In the first case, this asserted infinite set is the first cause, it address all those corresponding sets' infinity, and thus the infinity of the universe. The infinity of the universe then serves as a solution to the first cause impasse, which is not valid at all, as it merely introduces another first cause instead of eliminating it. In the second case, we simply transfer the infinity of the cosmos to the infinity of corresponding sets, which still serves as the first cause. Therefore, the solution of infinite causality chain is indifferent from the first cause argument, and cannot save the Cosmological claim (although Hume does not intend to do so).

Thus I have analyzed and rejected the cosmological theory. I shall then proceed and consider the ontological theory. This argument states that the cosmos is created by God. A good example of such argument is provided by Anselm, who claims that that firstly the idea of God states that God is perfect (and thus omnipotent). Secondly, existence in reality is greater than existence in imagination. Therefore, the God in imagination is less perfect than the real God. Thus the real God, as a perfect being must exist. Finally, since God is all-powerful, he can certainly create the cosmos.

Theories involving an all-powerful and most perfect God have a famous logical paradox, that is, “can God create a stone that he cannot lift?” If he can create such stone, he cannot lift it. Thus he is not all-powerful. If he cannot create such stone then he is also not all-powerful. Therefore God is not all-powerful in all circumstances and there exists something over which God could not exercise his might. It is thus reasonable to doubt that whether God truly has the power to create the cosmos. Apart from this, an immediate response to the Ontological argument will be: “why does God create the cosmos?” Even if God indeed can create the cosmos, and he does exist, there is no necessity for him to conduct such act.

Furthermore, the ontological theory must exclude God from the realm of the cosmos, otherwise he must create himself----an absurd proposition stating that God exists before its existence. This exclusion must be complete, that is, God must exist independently from the cosmos. If there is certain intersection between God and the cosmos, then when God creates the cosmos, he also creates this part. Therefore, this part only comes into existence when God creates it. However, as this part is also a part of God, it should exist before God creating the cosmos, and this would therefore form a contradiction. No part in the cosmos could be identical to any part of God, for if they are identical, they would be the same, thus leading to this contradiction. Therefore, God must exist completely external to the cosmos. But the banishment of God is problematic as well. Since God exists externally to the universe, things in the cosmos cannot interact with God-----they are completely different and mutually exclusive. As a consequence, there will be no means of interaction that could happen between things in the cosmos and God. All that the Ontological argument has done is a game of definitions and logics (analytic propositions). It cannot in effect "prove" the existence of God. To prove its existence, we may adopt Kant's terminology[4], that is, we must provide an a priori account of synthetic propositions. However, there is no synthetic proposition concerning the existence of God, for God does not interact with the cosmos (stated above). Therefore, it is simply impossible to prove God's existence: it remains as a mere idea, like unicorns or dragons. Then how could one state that such God creates the world? Aristotle may respond to this by stating his argument in the Physics, namely that God "creates" the world as the first mover because everything moves towards God as their nature of fulfilling their potential. But this claim states that God "creates" the world by mere existing, and the existence of God, as stated previously, is unable to prove. Therefore, this argument is also dubious.

Now I have properly refuted two schools of thoughts, I shall finally consider the teleological theory. Hume in his *Dialogues Concerning Natural Religion* writes the following:

[4] Critique of pure reasons

"Look round the world; contemplate the whole and every part of it: You will find it to be nothing but one great machine, subdivided into an infinite number of lesser machines, which again admit of subdivisions to a degree beyond what human senses and faculties can trace and explain. All these various machines, and even their most minute parts, are adjusted to each other with an accuracy which ravishes into admiration all men who have ever contemplated them. The curious adapting of means to ends, throughout all nature, resembles exactly, though it much exceeds, the productions of human contrivance; of human design, thought, wisdom, and intelligence. Since, therefore, the effects resemble each other, we are led to infer, by all the rules of analogy, that the causes also resemble; and that the Author of Nature is somewhat similar to the mind of man, though possessed of much larger faculties, proportioned to the grandeur of the work which he has executed. By this argument a posteriori, and by this argument alone, do we prove at once the existence of a Deity, and his similarity to human mind and intelligence."

Hume's main idea states that everything complicated ("All these various machines….with an accuracy ….ever contemplated them") is designed to exist ("the curious adapting of means to ends…..of human design, thought, wisdom, and intelligence.") and since things are designed to exist, they must have their designer ("the Author of Nature"). Therefore the cosmos, as a complex thing, should also be designed and has its designer.

In order to create this extremely complicated universe, the designer must know everything that the universe contains. This designer should therefore be an all-knowing God-like figure ("the Deity exists"). If I come up with a brand new invention, it must be designed by this all-knowing designer and delivered to my mind as a gift. It would therefore be reasonable to ask why people do not just sleep all day long, waiting for those great ideas and inventions coming out automatically in their minds. Why don't ancient Greeks build a spaceship out of nowhere? It can be argued that God could intervene indirectly, that one as a human being is designed in such way that is capable of designing other things (as what Hume suggests). However, this will not dismiss the argument here. For things designed by one are only possible when this ability is designed by God. Therefore, the designs of things one creates are necessarily contained in the design of this individual. This is similar to the argument of causes and effects, where causes contain no less reality than the effect. Furthermore, if we denote the design of things that I (mistakenly) believe that I design as set D1, the design of me myself is D2, then as shown above, D2 necessarily contains D1, which means that every elements of D1 is also in D2. Therefore, designing D2 is also designing D1, and thus there is no difference between direct and indirect intervention.

However, supporters of the teleological theory can argue that the evolving procedure of human society is also designed. It is determined by the great designer that human beings cannot build a spaceship before certain technologies are in place.

In addition, it can be argued that education and experience are essential for people to understand the idea of the designer and to be prepared when he delivers these ideas. Therefore one cannot merely wait for the designer's thoughts coming to him. No matter what counter-example I make, supporters of the teleological theory can always object it by saying that it is designed so. However, suppose that I claim that the teleological theory is wrong, then by my claim, there is something complicated that is not designed. One would then wonder whether my claim is correct. If my claim is true, then as my claim is a complicated thing and therefore is designed by the designer (either directly or indirectly through me), the designer of all complicated things (either through a direct or an indirect manner) confesses that there is something complicated that is not designed, which involves either an inconsistency (that is, something is both designed and not designed) or an incompleteness (that is, something complicated is not designed). In either case, the Teleological argument will be diminished. Therefore, my claim cannot be correct, it must be wrong. As a consequence, my claim as a complicated thing is designed (by the designer) to be wrong. However, I see no difference between this scenario and Descartes's famous argument of the "evil genius". This would cast doubts in every Teleological argument: since the designer is able to deceive me in complicated things, how can I know that Teleological arguments as complicated things are not deceptions? Therefore, under either case (whether my claim is false) the Teleological argument is dubious.

This problem leads to only one possible explanation: I make a mistake in claiming that the teleological claim is wrong. I must misunderstand the designer's thought. However, does the designer also design the mistake? If not, then my mistake, as a complicated thing, is not designed, which goes back to the first case in the previous paragraph. But if the mistake is designed, then it goes back to the second case in the previous paragraph. Therefore, this argument of mistake cannot save the Teleological argument.

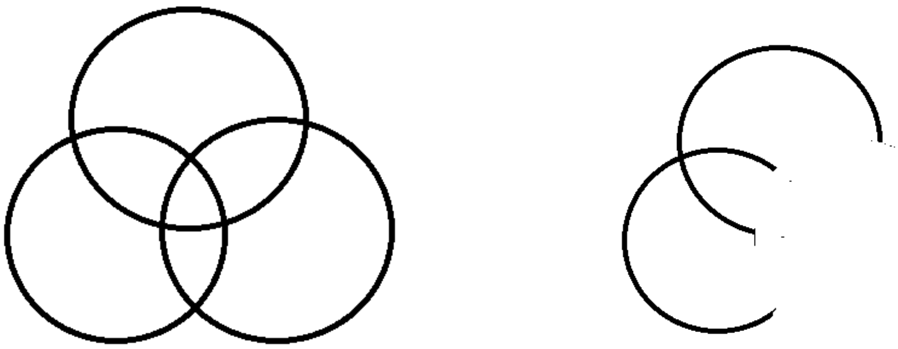
However, supporters of the teleological theory can still argue that "design" is not "control". They could argue that the designer is not a God-like figure but rather a function that applies to everything in the universe—a law that everything is made accordingly. However, this claim will go back to the cosmological theory because this "designer-equation" functions similarly to the first cause. Therefore, I can refute this statement in the same way.

Now I have already examined all three popular theories concerning the origin of the universe but none of them can convince me. Since none of these models work, it would be reasonable to switch to a different model to check whether it could yield any plausible result. I shall therefore introduce my own theory on the basis of the cosmos.

2. The Classical version of Unit Theory

I claim that the basis of the cosmos is a tiny thing called the Unit. I define it as the simplest and the most basic component that can exist. In addition, the only essence it possesses is randomness. This definition of the Unit implies that Units cannot be generally-described and generally-divided. The term “generally-described” means to be described by using of measurable standards like mass, size, weight and etc. Note that these standards do not include randomness because randomness is not measurable. Further, we assert arbitrarily that there are finitely many measurable attributes. The term ‘generally-divided’ means to be divided and this division would generate sub-beings in the same group (have shared properties) under all circumstances (with absolute certainty, that is) If one wants to generally-describe something under a certain group, this thing must acquire some shared characteristics among all such things (under the same group) that can be abstracted and quantified (the idea of group will be discussed later). However, as the most basic component of the universe, Units do not acquire any of those shared standards. They are random in terms of all possible attributes as well as in every single attribute, and that is the only essence they possess. This rules out all shared qualities, for the generality is possible but not necessary (guaranteed). It may be possible that all units at some moment share certain qualities, but at some other moments, these qualities would not be shared. Since no attribute is necessarily shared among all units under the precondition of randomness, it would be absurd to generalize any attribute. As no attribute is universalized among units, one cannot describe all units using any attribute but the only shared quality given a priori, that is, the randomness of behavior. It is true that science frequently generalizes about random events, but there must exist an property to be generalized. In terms of Units, as they behave randomly in all attributes, there is simply no such “event” aside from randomness that could be generalized upon. Therefore, our claim still holds, that the Units cannot be generally-described. It is true that multiple Units, under a certain selection can be measured (as stated previously), but no universal criterion can be applied to the entire group of Units. Therefore, the term ‘un—generally-measurable’ should be considered as being defined under the scope of all Units.

An individual Unit can have multiple properties. However, none of these properties can be displayed in every Unit (Units cannot be generally-described, that is). If Units can be generally-described, then there must be some portion of all Units that is responsible for the shared measurable characteristic that we can use to generalize and describe. Consequently, that part of every Unit can be separated from Units as an independent being, possessing only the measurable characteristic that this part is responsible of. Thus all Units can then be divided into something even more basic. One might raise an objection, namely, a property need not be a part. For instance, color is a property (attribute), not a part of an object. But color comes into being because its object absorbs most parts in the spectrum except the part which is responsible for that color. One can reasonably argue that this property of color is originated from the spectrum, which is not a part of the object. However, it is the special way of absorption this object acquires that makes it appear as having a certain color. This special absorption is however a result from the arrangement of its molecules. Therefore, we can simply subtract this special arrangement of molecules from this object. Note that after subtraction, neither the part subtracted nor the remainder should necessarily be the original object; it could not be an object at all (in our example, this special arrangement can hardly be anything). To make this point clear, let us imagine a Vienn Diagram consisting three intersecting circles. The entire diagram should be considered as an object, and each circle denotes a certain attribute.



Subtracting one attribute from this diagram would leave two broken circles, which denotes nothing, not even an object, for it contains no complete circle (attribute). This is exactly in case in our color example. The underlying logic of the proposed objection is that properties are shared in all parts of a being instead of being inherited by only one part. But such objection can be perfectly countered by our Vienn Diagram example. The overlapping circles denote that properties are shared by all parts. However, this does not imply that we cannot subtract these parts from the object. Rather, it only implies that the remainder of such subtraction is not necessarily a being, and that these subtractions cannot be conducted at the same time (for the intersection will be subtracted by many times).

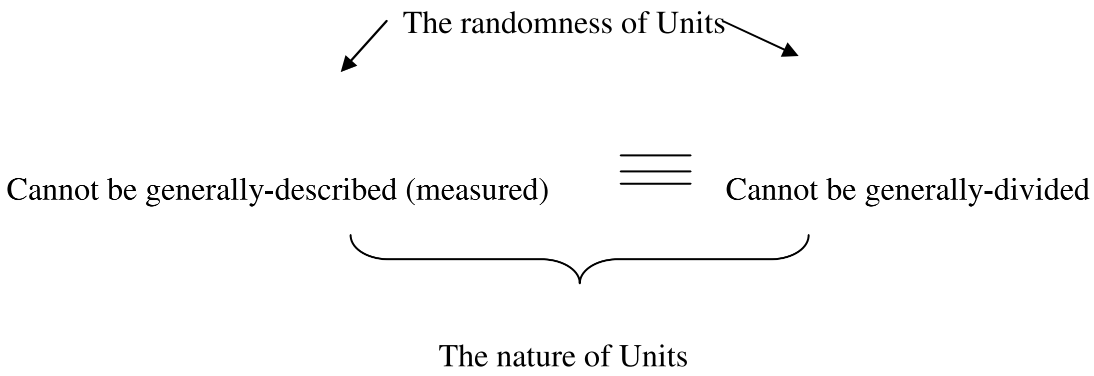
Moreover, this proposed objection has another important implication. As stated above, color can also be seen as a property of the spectrum, which is a different being from the object we perceive. It may lead to a conclusion that the property of a being may not necessarily be correspond by a part of this being, but rather by something exists outside this being. But this rationale does not hold. As in our example, the special arrangement of molecules of the object is also a necessary condition for color, it is simply impossible for a property to be possessed by an object if this property is nor inherited by this object’s parts but by something that exists completely outside this object. The reason for this claim is rather obvious: if a property exists independently from the perceived object, there is simply no interaction between this property and the object. In the color example, the property of color is accounted by both the light and the special arrangement of the molecules in the object perceived. Since this property is inherited by parts of this object, we can therefore perceive this property from this object. On the contrary, for a property that exists entirely independent from the object perceived, say the wave-particle duality of light, which exists solely on photons, cannot be perceived from our object. Consequently, it is impossible for a property that exists solely independent from an object to be reflected by this object. Therefore, our previous assertion, that if there is a shared property among beings under the same group, there must exist a shared part that corresponds to such property still holds before the proposed objection.

Now one might raise another objection. In the Vienn Diagram illustration, what we have is simply intersection of circles but not an overlapping one. That is to say, it is possible for all "parts" of a being to share one property. I would claim such property does not exist. Since this property overlaps the being entirely, it is identical to the being. Let us denote such property as P while other properties as P_i , and our being as B. According to what we have described previously, the shared property P completely overlaps the shape of the entire being. Therefore, subtracting this property from the being will leave nothing left, that is, B-P=0. Furthermore, we know that B consists of certain other properties, and the combination of all these properties that are not contained by P (if they are contained by P, they are not different properties but particular representations of P) results in B, for if the combination is not B, then P cannot overlap with the entire B. That is to say, $B = \cup P_i$ for all i. Therefore, we would have $P = \cup P_i$, that is, the shared property is the union of all other properties that this being B has. The equivalent relation here implies that the shared property is identical to the union of all other properties of this being B. This overlapping property is therefore not a single property but a collaboration of properties (the union of Pi). Thus, this objection of a completely shared property does not hold, for such property is not a property at all (but a result of properties held together). One may object this claim by asking "what about mass?" Let us look at photon for example: a photon has no rest mass (Other such particles include Gluon and Graviton). All elementary particles gain their mass through a special kind of particle called Higgs Boson (or Higgs particles, which is confirmed in 2013). Without the impact of this special particle, no elementary particle would have any mass. Therefore, we can again separate out all Higgs Boson (in principle) that corresponds to the property of mass as a being (under certain group), which is called Higgs Boson.

For now we have properly responded to all objections, and solidified our claim that if Units can be generally-described, they can be generally-divided. By the rule of contraposition, we now arrive at the conclusion that if Units cannot be generally-divided, they cannot be generally-described.

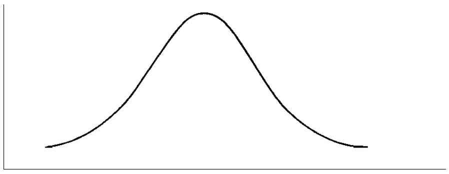
Meanwhile, if all Units cannot be generally-described, by definition no shared property can be generalized from all Units. Let us assume that Units can be generally-divided. Then by assumption there is a certain part inherited by every Unit that can be subtracted from all Units. As we have shown previously, this part must correspond to certain property. Since this part is shared by all Units, this property is shared by all Units. By definition this means that Units can be generally-described, thus violating our antecedent that Units cannot be generally-described. Therefore our assumption is false, and we must conclude that if Units cannot be generally described, they cannot be generally-divided.

Now we have a bicondition: if Units cannot be generally-described then it cannot be generally divided, and if Units cannot be generally divided, it cannot be generally described. This is not a cyclical reasoning but simply two sides of one coin. The definition of Units necessarily entails these two aspects, which are proved in the beginning of this section, and these two aspects, as shown above, are the same. This relationship can be shown in the graph below:

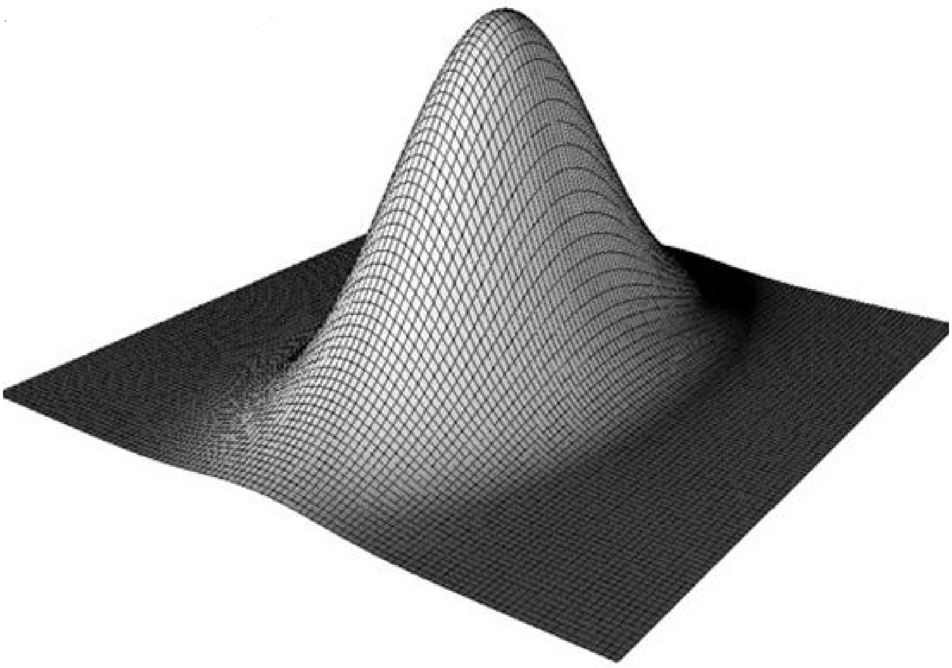


According to the definition, Units behave chaotically. If Units follow a certain rule, then they can both be completely-measured all the time according to that rule (it is certainly possible that a Unit can be measured at a time but not over time) and be divided (some part of its essence must be responsible for obeying that rule and thus can be divided). However, as the number of Unit is enormous, many Units happen to behave similarly (not identically). As we stated before, no character is shared by every Unit, but this does not imply that a character cannot happen to appear among some

Units. Since both there is no restriction on each Unit's behavior, the number of measurements is limited, and the number of Units is extremely large, Units shall generally feature as the normal distribution in terms of all descriptive measurements (not individual measurement but all measurements as a whole): although each individual acts randomly, in general a certain group of Units may seem to act according to specific laws. However, these laws that Units in general appear to follow cannot be used to measure them because not every Unit follows these laws---these laws are merely results of the large number (as we stated before, no property is necessarily universal). Furthermore, due to the complete randomness of Units, they also feature a normal distribution in each measurement. Therefore we have two axis of normal distribution: the normal distribution among different measurements and the normal distribution within each measurement. For instance, it is possible that only 5% Units acquire a single measurement called mass, while 70% acquire both mass and velocity. That is a partial reflection on Units in behaving randomly among different measurements. Within each measurement (like mass), the quantity of that measurement each unit within a certain group (not all Units) acquires would again show a normal pattern. Thus, the overall graph of Units would become a three dimensional dune, and each slice passing the center of this three dimensional graph would feature a perfect normal distribution (each vertical slice that does not pass the center, however, would be normal-like distribution/k-distribution. We still call them normal due to their similarities for the purpose of convenience, although such usage is not that accurate in terms of Math. However, this will not affect any conclusions, and is therefore allowed)



The graph of the normal distribution



The general pattern of all Units in every possible measurement

However, one can always question: “How can we describe Units if they behave randomly and we cannot measure them?” As addressed in the prior paragraph, although every Unit behaves randomly, they in general seem to obtain some common patterns due to the law of large numbers, that is, given a sufficiently large number of observations on the behavior of Units, the result will converge to the expected value, which is the mean of the normal distribution. Therefore, we cannot describe Units accurately, but we can give an approximation infinitely close to the actual state by slicing the general distribution (the three dimensional dune) into sufficiently small sections, that is, infinitely many slices where each is a normal (or normal-like) distribution, and use the mean of each slice as an approximation. This follows the same principle as basic calculus. For example, if I examine two randomly-picked apples carefully, I can find out that these two apples have lots of differences: size, color, weight and etc. It is impossible to find two identical apples, for according to Leibniz, if they are identical, they should be the same. However, in spite of so many differences, we still call these two different objects apples. All apples are different from each other, yet we still put them under the same category instead of naming them as different kinds of pasta. People abstract commonalities among different instances. This ability will later on be discussed in the paragraph concerning human cognition. However, note that there is no way to accurately commonly describe an apple: any measurement is an approximation of the actual state. For instance, we say that an apple weighs 300g, in single digit accuracy. If we make the accuracy level of 0.1, its mass could very well be 300.7g, if extend to 0.01, it could be 300.72g. All these measurements are approximations of the actual mass, which is unknown. Similarly, although one can never accurately commonly describe what exactly a Unit is, he can still make approximations, like what people do with our apple. The approximation one makes will infinitely approach the exact state, but can never achieve it. However, we need to make it clear that the real state of Units is unperceivable due to its random nature. Consequently, this paper is one of the approximations, and the theory it proposes is also an approximation (and a fairly good one). Its inadequacy will be pointed out later.

This randomness of Units does not imply that the world is unstable---perfect chaos is the most stable situation. In the contrast with the common sense, a perfectly organized and balanced situation is not stable at all because the balance can be easily destroyed by even the smallest disturbance. A balanced equation will easily lean to one side where an incremental weight is added. On the contrary, a perfectly chaotic situation is very stable because it is already chaotic. Disturbances and changes have little impacts on the entire system. The theory of “Entropy Increase” can be used as a great example. Entropy represents how chaotic a system is. This theory points out that a system will automatically tend to become more chaotic through reactions because it is more stable. Similarly, Units behave randomly and achieve the state of perfect chaos automatically in order to reach the most stable state. And under this chaotic state, the law of big number prevails and general patterns that are shared by Units will appear in the greatest extent.

Because a group of Units acts similarly (not identically) and show a specific pattern, this group can be perceived as one entity. Different entities guided by different patterns can further form an entity in a higher level. Through this procedure, Units eventually build up the universe that we perceive.

3. Concerning the construction of the cosmos

---------------- the state of beings, definition of changes and causality

The Unit Theory introduced in section 2 seems like another version of the Atomists' theory (although we have already shown one major difference). However, there is another major difference between this two models, that is, the Unit Theory holds that properties of Units are never certain. Unlike atoms, Units behave randomly. They do not abide by any rules or physics laws and the general pattern of Units depend on the observation. For the exact state of one single Unit, as stated before, cannot be accurately described in ordinary measurements. It has different attributes on different observations. Even for a short period of time it indeed possesses certain attributes, the magnitudes in these attributes may vary. We could only predict (perhaps even without any accountability) that there is an X percent chance that a unit may possess the following attributes, and for M attribute it has Y percent chance to score the value A. In other words, there is no certainty in a Unit's character, and the actual state of that unit depends solely on the observation. Coin flipping can be used as an analogy. Although we know the possibility of the state "face up" to occur is 50%, we never know what state the coin will appear in the next toss. This randomness is a solution to the problem brought up by Gödel, as the traditional formal system is itself problematic. Further, Modern physics, especially Quantum Physics demands variability in the old mechanical world. However, traditional metaphysics fail to incorporate with such demand. This need can be satisfied by the Unit theory. Finally, statistic models permits a new solution to access the ‘real state of beings’: through brute force. Any complex phenomenon can be duplicated by conducting sampling experiment for sufficiently many times. The reason for asserting this randomness as well as the implementation of such form will be discussed later in the final section.

As stated before, this randomness of a single Unit does not significantly affect the general pattern. As stated previously, since the whole system is already in the state of chaos, a disturbance caused by one Unit is negligible. The general pattern of a certain group of Units indeed depends on the observation, as every single Unit’s status depends on the observation. However, the overall state of a group of Units maintains because the possibility of all Units behaving in the same way is astronomically small. Even in a two-value situation, letting 500 coins all turns “face-up” coincidentally is almost an impossible task, let alone the scenario of a group of trillions Units where each facing trillions of choices. Therefore, although almost all Units would change their state between two independent observations, they simply change into each other, and the general pattern still remains.

This assertion, however, leads to a counter-intuitive situation where everything is part of a constant changing process. There is no longer the concept of constancy. When we refer to something as staying unchanged, we are actually stating that this subject remains in the array of [$\overline{X} - n\sigma$, $\overline{X} + n\sigma$]. We call this array a cognitive group (group as abbreviation). This array also represents the concept of that thing. Here $\overline{X}$ denotes the mean state of all possible states that a being may appear. This is represented by the conceptual knowledge that human possess. For instance, when we confront the term “apple’, we do not firstly think of a single instance of an apple, not the apple I ate this morning nor the one I stole from student dining hall yesterday. Rather, we refer to the idea or the concept of apple---an abstract apple. However, the relationship between “the form of apple” and apples is not what Plato suggests as the relationship between a perfect apple and its incompetent mimics. In fact, it is a relationship between a compromised average of all possible observation states and a single observation. In Kant’s terminology, this mean is the mean not because it exemplifies something, but because it falls in short of nothing, that is, it cannot be denied by any criteria under that group. Here the mean is not an objective mean of Units (or composition of Units), as it is simply nonsense to talk about an objective mean of Units—it cannot be cognized (stated previously). To take a mean is simply to manually take a slice the three dimensional dune we used previously. As each mean represents certain concept, the action of picking a mean is simply the action of choosing the object (of beings) that we wish to conceive. The σ here denotes the variation of Units (or composition of Units as beings) from the average (mean), which is an objective figure embedded by the normal distribution we discussed previously. This variation is pre-determined by the nature $\overline{X}$ we choose. That is to say, for any arbitrary mean, the range of variation of beings rest around this concept is determined by the mean. This variation is objective in the sense that it is independent from human will once the mean is chosen. As we stated above, to pick a mean is to take a slice of the three-dimensional dune. Whether this slice is flat or slim depends on the position of the slice.

Echoing our last claim in the last paragraph, one might argue that for some concept, we have a much more rigorous criterion compared to other concepts. For instance, we are very strict with beings that are qualified for the concept "a red square brick", but we get quite lax dealing with beings that are qualified for the concept of "red". If the variation in any selected concept is objective, then how could we explain this difference (narrowing)? This question is answered by the parameter n that precedes σ in the array. It denotes as the magnitude of variations that humans accept as "being within the boundary". In our example, the n for "red square bricks" is much smaller that the n for "red things". Therefore, to generate a concept is to pick its compromised average (form) and the magnitude of variation that we deem as acceptable.

To summarize this, there is no "objective" group of Units. Humans, for the purpose of describing and thus understanding the objective world, subjectively categorize Units into different groups of concepts, like chair, apple, tree and etc. These concepts are not a single standard of beings but rather arrays of variations. It consists both the objective variation and the subjective mean as well as magnitude of variations. Although the magnitude of variation (nσ) or the effective acceptable variation is determined subjectively, the actual variation is objectively imbedded by the nature of Units. Furthermore, within the boundary of a concept there may exist arrays of sub-concepts, but within each sub-concept (which is a specification (narrowing) of a general concept. E.g. red apple in terms of apple), observations behave in accord with a normal or normal-like distribution pattern. The conceptual world, or the experienced world, is therefore an n-dimensional object which is normal (in loose terms) in every i^{th} dimension, where each dimension is a variation-applicable quality. Here the i^{th} dimension does not denote any axis in the physical world (unlike what we will discuss later) but rather a representation of different layers or hierarchies of human thoughts. This does not assert that human thinking process has a hierarchical structure, but rather human's cognition has multiple dimensions: each dimension is a measurement we developed to abstract and generalize beings in the objective world, and it is through these measurements that we 'perceive' the world. The difference between physical dimension and cognitive dimension is therefore stated. Unlike the physical dimension (which only has 11 layers), the cognitive dimension is capable to fit in infinitude: it is a matrix-based mathematical N dimensional space.

We have asserted previously that in general, an arbitrary observation of any group of Units shall generally lie within the boundary of $[\overline{X} - n\sigma, \overline{X} + n\sigma]$. But this does not imply that this observation will always reside in this realm. There is a certain possibility that all Units in one observation behave in extreme and thus make the observation outside the given boundary. For instance, there is a possibility that I can directly walk through the wall. However, this possibility is so small that even if I bash the wall once per second for my entire life, I could not pass through it as what Harry Potter does in the train station. Any phenomena are possible, but some are rare because their probability of occurrences is utterly low. Since the occurrences of these phenomena are so rare, human mind simply approximates their occurrence as impossible, for example, we say that it is impossible of one to walk through a wall.

Now that we have finished the discussion concerning groups, we suffice to proceed to the discussion of changes. There are only two kinds of changes, namely, changes within a group and changes across groups. Firstly, let us start with the easier one: changes within a group. As we stated previously, a group is described by a mean (X) and a variation (nσ). The specification of a group (the narrowing process) is discussed previously, thus we could exclude n from the variation and only pay attention to σ. Due to human mind's complexity, a group that we form rarely contains only one dimension (e.g. mass, length, color and etc.). A group with only one dimension is called a measurable standard (recall our definition of generally-described in the beginning of section 2), or a single group, as being referred to previously. To make our argument clear, I shall use an example to illustrate: suppose a single group with mean $\overline{X}$ and variation σ. A typical occurrence within this group will be x, where x - $\overline{X}$ is less than our variation σ times the amplitude of restriction n (reflects the strictness of our artificial group). A change within a single group is a change in the value x, making it x'. However, its deviation from the mean (x'-$\bar{X}$) shall still be less than nσ. That is to say, Change within a group is shifting some values concerning certain attributes of a being without changing its category. To be more specific, the original being lies somewhere in the distribution, and the change within the group shifts that being to a different position within that distribution. However, groups do not merely contain one dimension. More often, a group formed by human mind contains several dimensions, and thus the mean of this group is the combined mean of different dimensions. For a group consist multiple dimensions, its variation will not be the variation within a single dimension. In fact, different dimensions within a group can have different variations. To be more specific, I shall now give an example. Suppose our group consist three dimensions, A, B and C, each has a mean ($\bar{A}$, $\bar{B}$ and $\bar{C}$) and a respective variation($n_a\sigma_a$, $n_b\sigma_b$, and $n_c\sigma_c$). As stated previously, our group can be described by a mean and a variation. In this case, these two characters will be given in the form of a triplet. Namely, our mean shall be ($\bar{A}$, $\bar{B}$, $\bar{C}$) and variation: ($n_a\sigma_a$, $n_b\sigma_b$, $n_c\sigma_c$). A common occurrence in this group would be (a,b,c) where a is an element of A, b is an element of B and c is an element of C. Clearly, this group consisting multiple dimensions is merely a super-group that combines three single group (dimension). Therefore, a change within this group is merely a combined single group change. In our example, this change will shift our point from (a, b, c) to (a' b' c')

After finishing asserting changes that occur within the boundary of one single group, it will be reasonable to discuss changes among different groups. As stated in both Physics and Chemistry, there exist two different kinds of changes: physical change, which involves changes in measurement like length, weight, and chemical change, which involves the reaction among different beings that transfer them from one category to another. Both changes affect individual instances through applying to the entire group, since in both Physics and Chemistry we do not talk about changes that affect only an individual molecule but rather a group of molecules shifting their status. For a random group being arbitrarily selected, we would denote it using previous array notation: $[\overline{X} - n\sigma, \overline{X} + n\sigma]$. The physical change is hence a function that changes the parameter n. For example, the original array represents all ropes that have length of five meters. The target array represents all ropes that have length of ten meters. The physical change here that we want to describe is called stretching, which will shift the original array to the target array. Under this circumstance, the object being described is still rope (although it has special requirements), thus making the original array a sub-group of the super group which represents all ropes. Therefore, the original array that we want to operate on shall inherit properties from the super group (this does not change the randomness, for this only states a limitation on the range of properties that Units could vary): $\overline{X}$ shall represent the compromised mean of ropes, and n is designated to correspond to all the requirements which include the special criterion: length. We shall denote this original array as C1. Applying the desired physical change to the group will generate a different array of ropes, that is, f(C1)--→ C2, where C2 equals $[\overline{X} - m\sigma, \overline{X} + m\sigma]$. Here in this new array the mean

$\overline{X}$ will not change, as the general "form" is still ropes. However, the criterion that is employed to select qualified ropes changes (from n to m), since now the special requirement changes from length five to length ten. By comparing the original array and the target array, we can conclude that physical change, therefore, is a function on the parameter, n. i.e. a change in possible variation.

In terms of chemical change, the process is similar to the mathematical operation of addition. The chemical change involves reactions for at least two beings. However, I will only discuss situations where exactly two beings are involved simply for the purpose of convenience. Moreover, in the base case, we assume exactly two new beings will be generated. All other situations are analogical to the base case. Let us denote the two groups arbitrarily selected as C1 and C2, where C1 is denoted as [$\overline{X}1 - n\sigma$, $\overline{X}1 + n\sigma$] and C2 is denoted as [$\overline{X}2 - m\sigma$, $\overline{X}2 + m\sigma$]. The chemical change will firstly add these two arrays into an intermediate array, which has the mean of $\overline{X}1+\overline{X}2$. Then this array will split into two new arrays C3, C4 with means of $\overline{X}3$ and $\overline{X}4$. In addition, $\overline{X}3+\overline{X}4$ shall equal $\overline{X}1+\overline{X}2$. The parameters, n and m for C3 and C4 respectively, however, are not applicable to the mathematic rule of addition as they are arbitrarily designated subjective value. We can simplify this process in the following example: there exist two different beings, 1 and 4 (represented by their means respectively). The chemical process that generate two new beings will firstly combine this two (1+4) and then generate desired new beings (2+3). A chemist would probably agree on this, as this assertion follows the general rule that nothing could be created from nothing. The Unit theory does not intend to entirely replace the existing theories, but rather a modification of it, like the theory of relativity in terms of classic physics. It is not necessary to replace atoms, as in that level of micro-world the pattern of Units will not be significant. It will only be significant under at least Quark level. In fact, the pattern of electrons has indicated certain pattern of Units. The addition on simply real numbers is justified, as all normal distributions are described by two criterions: mean and variance. The variance, σ , as stated previously, is objective and is only determined by means. Therefore, distributions differ from each other only in terms of different means. Adding two distributions is thus adding two real numbers. The true process of chemical change is, therefore, the addition of different normal distributions. However, as we never perceive things in terms of the entire distribution but rather of concepts, which are sub-arrays of distributions (groups), we shall manually select an array through either consciously or unconsciously selecting acceptable magnitude of variation-----that is to say, to select an arbitrary n value. And this sub-array of the already added distribution is one of the newly generated substances. The major difference between physical and chemical changes, which is depicted in ordinary Chemistry as whether the process involves changes on the substance (beings), is depicted in the Unit theory as whether the change applies to distributions and thus groups. The array form of chemical changes given above in the form of groups (arrays) is not what "really happens" but what is conceived by humans. The real chemical change, however, is the quasi addition of different normal distributions. After establishing the definition of changes, we can employ them to construct the rest of the cosmos.

Now we have discussed the Unit-cosmos in a three-dimensional mechanical world. We have shown its three-dimensional version of its basis in section two and how it could constitute the entire cosmos through changes in the third section. However, to make our argument complete, there is still a question that needs to be pondered upon: causality. As a matter of human nature, we often consider phenomena under the setting of causality. We say propositions like "the gravitational force causes apples to fall." and "the inclination of beings to fulfill their full potential causes apples to fall (Aristotle)", even though the latter in today's view is clearly false. Our example here does reveal an interesting fact. When we assert that one thing causes another, we are in fact concluding that the occurrence of the cause necessarily leads to the occurrence of the effect. However, this assertion may be fallacious, as what we see in a second example. In this case, the occurrence of the cause does not necessarily lead to the occurrence of the effect. Therefore, what we believe as causes and effects may even have no relation at all. This idea is echoed by Hume, who argues that minds associate ideas by using causes and effects. Things being related may have no connecting principle at all (He calls such relation as Philosophical relations (gives certitude), while those have a connecting principle as Natural relations (give connections). Causality is the only form of relation that lies within both realms, thus may or may not have connecting principles). Instead they are artificially juxtaposed by the mind[5].

[5] *A Treatise of Human Nature*

Adopting a similar point, I claim that humans make causal propositions and consider phenomena under the setting of causality because of the need of expectation. Being able to form accurate expectations allows humans to be prepared for the future, using fewer resources to react when the outcome indeed occurs. For example, upon hearing wolf howling, we will expect the existence of wolves in surrounding areas. The expectation of their existence makes us prepared. One could have made several plans (to flee or to fight for instance) before the wolves do appear. Comparing to making plans when wolves do appear, this ability to expect and react is crucial for survival. Therefore, we claim that it is rather human nature to consider phenomena in terms of causes and effects.

Again, since we have already defined groups, there are only two kinds of causalities, namely, causality within a group and causality across groups. I shall claim that causality within a group is a misperception and can always be decomposed into causality among groups. As what we stated before, a group is an artificial category that we humans invent to abstract differences from beings, thus generalizing and preparing them for cognition. Therefore, beings under the same category are cognized as different instantiations (representations) of the same thing, for example, two different apples under the group of apples. Since two beings that we shall consider belong to the same category, saying one being causes another is to assert that this group is capable of causing itself. It therefore becomes self-implementing and self-sufficient. That is to say, this group of beings can exist independently from anything else. As we stated before, human beings cognize things in terms of causality, the independence of this group separates it from forming causal relationship with any other groups, therefore there is no way for human to cognize this group except from itself. That is to say, in order to know this group we must know this group, which involves circular reasoning. To make a rather loose example, an apple could not cause an apple. Surely one would argue that an apple would grow into an apple tree, and thus causing the existence of another apple. But this assertion diverges from our proposition, as this apple causes an apple tree first, and then the apple tree causes another apple. Therefore, any self-causing relationship is a misconception that usually involves mediate steps and can therefore be decomposed into intermediate cross-group causal relationships.

Now for the purpose of convenience, let us simply discuss the easiest kind of cross-group causal relationship, namely A causes B, where A and B denote different groups. Note here that we use groups instead of instances, as causality involves certain generality. An instance-only-based causality is meaningless. As causality is used for forming future prediction, a causal relation that could only apply to one single instance is not useful at all. There is simply no incentive for human beings to form such relationship. Therefore, any causal relationship is an onto mapping (surjective function, that is, all elements in the image set are mapped by elements in the domain) from one group to the other. Surely, one would argue that it is fairly common for one to assert single instance-based causality. For example, we could say that "this stab causes Caesar's death" where "this stab" is an instance and Caesar is also an instance. However, this assertion again is a misperception. It is an instantiation of a more general causality: stabs cause human death. Thus we shall not call such assertion as an instance-based causal relationship, but rather an instantiation of a causal relationship. Surely one would argue that generality cannot exist without instances, i.e., it is from the observations of many instances that the generality raises. Therefore it is wrong to dismiss instance-based causality. This objection is only partially true, for it involves wrong terminology. Under our theoretical framework, instance-based causalities are just single observations. They lack generality which is essential for making future predictions, which is the essence of causality. Instance-based "causality" is meaningless because it cannot be called as causality, not because there is no such correlation between the appearances of two instances. One may ask, "why generality is one of the major characteristics of causality?" Recall our definition of causality: it is a cognitive representation of the high probability of two instances

Let us assume a scenario where A causes B, and the causal relationship is denoted as f. Since A is an (artificial/ cognitive) group, it is generated to represent a certain array of similar beings, denoting as a_i, where i is any natural number. Similarly, B is a group that represent a certain array of similar beings, denoting as b_i, where is is any natural number. The causal function f is formed when an occurrence of an arbitrary a_i coincides with an occurrence of an arbitrary b_i in high frequency (of which we do not know exactly the number, and in each frequency b_i is not necessarily the same). This assertion eliminates the necessity from causality. A cause no longer necessarily results in an effect. There can be situations where the occurrence of a cause coincides with nothing. We therefore reduce necessity into probability, certainty into coincidences. This is the final step to break down the traditional mechanistic metaphysics: as long as the necessary casual relationships still exist, our cosmos cannot be completely random even under the setting of random Units. Before winding up our discussion, there is a final point to be made. This causality only deals with synthetic judgments, and has nothing to do with the causality within analytical judgments. Any analytical causality belongs to the realm of logics and concerns only artificial concepts without instantiations. The statement "A necessarily causes B" without synthetically instantiate A and B (in our example above, we assert that A and B are different groups that represent certain beings, which is an instantiation) is a totally legitimate proposition. Mathematics and Logics are therefore preserved.

Now we have finished our construction of Unit theory based metaphysics. However, these are all "classical" constructions of the cosmos, which is rather mechanical. This classical construction fails to recognize the potential of the Unit Theory in two ways, that it firstly fails to fully exploit its essential feature of randomness and secondly it fails to integrate time into the mechanical three-dimensional world: everything being discussed previously is timeless. Since we have stated that all beings under Unit Theory are not certain substances but possibilities of featuring different states, integrating time into the classical theory will lead to the creation of parallel worlds in higher dimensions. I therefore propose the general version of Unit Theory, which addresses the two failures of the classical theory stated above.

4. The general version of the Unit Theory

Before integrating time into the Unit Theory, it is necessary for us to determine what time is. First of all, it is necessary to determine the form of existence of time: whether time exists as a physical being or as a concept. That is to say, whether time is a compound of Units that is a distribution and thus can be approximated by invented arrays or it is already an approximation that is employed in describing distributions. The first option corresponds to the existence as an object in the physical world (as a form of single or combined units), while the second corresponds to the existence as a concept, which is a human invention that involves groups (conceptual representation of beings, which involves variations), pure concepts (just one value instead of variations like a group, e.g. mathematical concepts. This belongs to the analytic realm, which we shall not discuss), or relationships (functions that map one group to the other). An existence outside these two realms is unimaginable. According to existing evidence, it will be absurd to say that certain particles compose time through different combinations. Rather, time is used to capture the differences that occur among different observations. Therefore, I must cast aside the thought that the determinant of time is something physical and claim that time is a concept. This concept, as stated above, includes two essential features: firstly, it involves multiple observations, and secondly, there must be differences among these observations. This concept of time we use here is rather an Aristotelian one, which states that if there is no change, there is no time. This may seems absurd at the first glance, but as we stated above, time is a concept invented to describe changes (in loose term, a relationship). As long as there is a tiny difference among all these Units, there is the lapse of time. However, there exists a possibility that all Units appear in the same state between two adjoined observations (although this possibility is utterly small). In this case, time is indeed static between these two observations. But we will be unaware of such situation, as there is simply no way to cognize such situation.

However, so far we only showed what time is. It is reasonable for one to ask "how could we measure time?" As we discussed in previous sections, we use conceptual approximations that enable abstract thinking and communications. These conceptual approximations ignore extremities that are almost impossible to occur. In this case, the extremity is the stasis of time. Since each time when we make an observation (we assume that making observations cost no time at each attempt), there are some differences; we then automatically assume the continuity of time. Note here both differences and our perceptions are in three dimensions. What we truly perceive is in fact scattered three dimensional images:

A B C D E F G (what we truly perceive)

However, due to the persistence of vision, we tend to believe that these scattered phases are continuous.

A G (what we think)

In terms of time, we shall have following similar graphs

A t1' B t2' C t3' D t4' E t5' F (what we truly perceive)

Since observation A is different from observation B, by definition there exist time between A and B, namely t1. Similarly, we have t2, t3 and etc. Note that there is no time at A, B, C and etc., for we have assumed the time-costlessness of observations. Instead of scattered phases, what we believe that actually happens is now a continuous movement from phase A to G

A t1 t2 t3 t4 t5 F (what we think)

However, this belief would also make time continuous. The continuity of the concept of movements entails the continuity of time. We therefore believe that time is parallel to a uniform line. In physics, it is often perceived as the fourth dimension.

Now let us integrate the concept of time into our classical Unit Theory. Since the concept of time implies multiple observations and differences among observations, we are justified to give the following example.

Suppose the entire cosmos has three different states, A, B and C with possibilities of 20%, 60% and 20% respectively. We only make two observations. Then all the potential consequences of changing sequence are: A-B, A-C, B-C, B-A, C-A and C-B. Instances as A-A, B-B and C-C are eliminated because although the possibility of their occurrence is considerable in this simplified example, it is astronomically low in real life. In addition, these sequences are meaningless as they are all unperceivable. Furthermore, sequence A-B is distinct from sequence B-A, for the former starts with cosmos A and ends with cosmos B while the later starts with cosmos B and ends with cosmos A. In this scenario, we have six distinct sequences of cosmos. Before making any observation, one does not know which sequence he will end up with. But once he makes an observation, he has been determined randomly in one of these six sequences. If we call each sequence a distinct 'world line' then in this scenario, we have six parallel world lines. In the real world, as the cosmos is consisted with countless numbers of Units, there exist countless amounts of states that it could appear. We shall denote the number of all possible states as M, and further denote the number of observations (which is also astronomically large) as N, then the number of world lines would be:

$$P= M*(M-1)*(M-1)*\ldots\ldots*(M-1)=M(M-1)^{N-1}$$

The general Unit Theory therefore states that due to the randomness of each individual Unit, the whole cosmos is in a possibility cloud. The uncertainty of the cosmos consequently results in the existence of different world lines. What specific world line that we are in depends on the result of corresponding observation. Before observation, there exist many possible world lines that we could step in. However, after the conduction of the observation, the specific world line is determined, and all other lines will collapse. This is compatible with the Copenhagen Solution in Quantum Physics, which will be elaborated in the last section. In addition, this is compatible with the common belief that there are many futures but a determined past. After all, one intention of bringing in the notion of randomness into metaphysics is to secure free will from a mechanic cosmos (which is always associated with determinism). However, one might wonder if under the Unit theory, level things are deterministic at the macro level given our earlier discussion on changes (especially Chemical changes). This concern, fortunately, is not valid, and the macro level is not deterministic. All the contents in our earlier discussion on changes only describe what will happen when such changes do occur. There is no guarantee that these changes will necessarily occur. Therefore, the macro level is not deterministic at all.

The classical Unit Theory offers a three-dimensional interpretation of the Cosmos. However, the general theory offers a full version of the cosmos. Before stating the reason for this assertion, we shall firstly figure out the method of moving up from lower dimensions to higher dimensions. To achieve that, we need to consider the current dimension as a point, and suppose another similar point. Then the higher dimension will be the line that links these two points together. Let us start from the first dimension. The first dimension is just a line that links two non-dimensional points, which features only length with neither height nor width. Now consider the second dimension. Following our methodology, assuming this line as point and imagine a similar point which is different from this point. The line that links these two points will give a width to the 1^{st} dimension and make it the second dimension. From analytic geometry, we know that any vectors in this second dimension can be represented by certain product of the length vector and the width vector. Therefore the second dimension is just the sum of all lines in one plane. Now assuming all the lines in a plane as a point, and assume another similar point, then the line connecting these two points will be a line that connect these two planes, which gives the height to the system. Again by analytical geometry, any vectors in this space can be represented by certain products of length width and height. A three dimensional world in the fourth dimension is a three dimensional moment placed in time, which is merely an observation with no time background (recall our argument about time in previous paragraphs). Only when there is another observation could we form the sense of time, that is, forming a line between two static three-dimensional observations. The fourth dimension is such linkage between two neighboring three-dimensional observations (the line that links two three dimensions as points). This only gives temporal sense to the three dimensional world instead of forming any time line. The linkage may seem to be a world line but is not. For this linkage links only two points (observations) without involving a third point. Therefore it simply denotes an instance in time flow and should only be called as a moment (or now if you prefer). Now (literally) for a fifth dimension, we shall use the previous strategy and treat this fourth dimensional world as a point A. Suppose another point B, which is another moment in the timeline. Clearly, asserting another point will create a sequential order of the two existing points. Note here that the asserted point cannot happen in the past, for all past events are determined and is no longer in the timeline. This movement forms a sequence A-B, where A denotes a given now and B denotes a point in the future, and we call this line as a world line. This may seem a little bit abstract to understand. I shall therefore make an analogy to the first dimension as a clarification. Remember the fourth dimension only gives the temporal sense in the system, i.e., the fourth dimension is just a moment in time flow. We can parallel it with our zero-dimensional point. Imagining another point is to assert another time moment. Then the line than links these two points will only give the length to the system, that is, a special time line from a point to another. We call this line “world line” here. Now for the sixth dimension, we shall imagine the fifth dimension as a point, and then imagine a similar point. This point can therefore be denoted as A-C, where C is a forth dimensional future that differs from B. Then the sixth dimension is the way jumping from sequence A-B to sequence A-C. In an analogy to the second dimension, this sixth dimension adds “width” to the previous fifth dimension, where there is only “length”. Note here that both sequence starts from A, since it denotes the current three-dimensional cosmos that is already determined. As the sixth dimension is a way to jump from one sequence starting from A to another sequence starting from A, we can plainly say that a sixth dimensional movement is a movement that jumps across different futures. Making the sixth dimension a point, the other point shall be a similar such jump, say from A-C to A-D, then the line that links these two points is a switch between different jumps. In an analogy to the third dimension, this seventh dimension adds "width" to the system. Therefore, the seventh dimension is the summation of all possible futures of a given "now" A. Now proceeding to the eighth dimension, we assume the seventh dimension as a point, then another point would be all possible futures starting from a different given "now", say B. The linkage between these two points will therefore become the eighth dimension, that is, a jump from all possible world lines starting from the current world to the summation of all possible world lines from a different current world. To put it loosely, such jump is an action of changing the past. it is a function from A-X to B-X, where X can be instantiate by any futures. Now let us imagine this function as a point, and then assume another similar point, which denotes the function from C-X to D-X. The ninth dimension is therefore the collection of all such jumps. That is to say, the ninth dimension is the summation of all possible cosmos sequences starting with different initial cosmos-----a summation of A-F, B-C, D-E and etc. Using the same rule on the ninth dimension, all possible cosmos sequences become a point in the tenth dimension, and that tenth-dimensional point is what we call the true cosmos C. it is simply logically impossible to imagine another such point, for the point of true cosmos C has already included all possible past and all possible future. This set is simply inaugmentable. For any being b you could possibly imagine, b belongs to C. This tenth dimensional interpretation is not contradictory with our three-dimensional classical Unit Theory interpretation, since it is the randomness of the three-dimensional cosmos that enables the existence of the fifth and other higher dimensions. Namely, the randomness of Units enables the possibility of a different future, for any representation we have could be represented differently simply by the randomness of Units, and this different future can be achieved, which is guaranteed by the nature of causality which we established in the previous section, for given an initial condition, its effect (a future) is not determined but a matter of possibilities. Therefore, the three dimensional representation, or the classic version of the Unit theory, guarantees the general Units theory, and thus is not a contradiction to it. Now we have reached the end of our long inquiry. The general theory of Unit states that:

The cosmos is a point in tenth dimension.

5. The representation of Unit Theory

In previous sections, the Unit Theory is represented by using set theory. I will further claim that the entire theory can be represented by a formal system, which is based on the set theory. As we know, the credibility of a formal system is challenged by Goedel's theorem. However, I claim that Goedel's theorem is not a contradiction of the formal system if given a proper interpretation of the latter (this interpretation is the Unit Theory). The inadequacy of the formal system is a necessary result of the randomness once asserting the formal system as a representation of the Cosmos under Unit Theory. Although Goedel's theorem is indeed a threat to formal systems in general, it is not a threat to a specific system where the inadequacy it inherits is no longer a drawback but the only possible representation. To support this argument, I shall show in the following section that the inadequacy of a formal system also has significant meaning in representing the Cosmos under the framework of the Unit Theory, but before that, I will clarify that the formal system used in this thesis is the formal system used in the Typographical Number Theory (TNT).

Firstly, we shall briefly introduce Goedel's proof of his theorem. Goedel's core idea is to create a well-defined paradox similar to the statement "this sentence is false" in the formal system, which involves self-referencing. The trick is, assigning either true or false to this paradox will consequentially assign the opposite value to it at the same time, thus making the system able to prove both the statement and its negation, which is apparently a violation of the definition of consistency. To maintain its position as being consistent, the system must not determine the value of this self-referencing statement, making the system incomplete since this paradox----a well-defined formula---cannot be shown by using formal deduction on the system. However, creating a self-referencing formula in a formal system is difficult. To achieve that, Goedel adopts a method called “Goedel Numbering”, which assigns each symbol used by the system a unique Goedel number. By doing so he manages to represent elements of this system in the form of numbers. (We will put aside the number-assigning of proofs now for the purpose of convenience. However, in later argument this assignment becomes important, and we will pick it up in due course). Goedel then proceeds to a special function called substitution, which substitute all free occurrences of one variable in a well-defined formula with another variable. Specifically, Goedel focuses on one particular substitution formula denoting as sub(y, 33, y). This function denotes the process of substituting every free variable having the assigned value of 33 with y in a function whose code is itself y. Then he proposes the following assertion: there is no such proof in the system that is obtained from sub(y, 33, y). This assertion consists of symbols used by the system, and thus has its own assigned Goedel Number, denoting it as q. Now let us substitute every free y in the previous assertion with q and we will have “there is no such proof in the system that is obtained from sub(q, 33, q)”. But this new assertion is obtained from the very process of sub(q, 33, q). Therefore, this new assertion in fact asserts its own improvability. If we can prove this assertion, then it is not provable, however, if we cannot prove this assertion, then it cannot prove that itself is not provable, thus making it conversely provable. As a result, this well-formed formula is the one Goedel is seeking for: it is both provable and refutable at the same time.

In the Unit Theory, we know that due to the randomness, the actual state of a Unit is in a possibility cloud. Suppose that a Unit, A, has two different states A1 and A2 (under which we do not know). If we conduct an observation on this Unit, the result could either be A1 or A2 (not both), but before this observation, the state of A is a mixture of both A1 and A2, even under the premise that A1 and A2 are exclusive from each other. This state of mixture of exclusive states is called Quantum Superposition in Quantum Physics. I will borrow this term and use it in the following discussion. Similarly in the macro world, before making any observation, the existing world is the initial condition, denoting as A. We know from previous discussions that it could lead to different world lines such as A-B and A-C. This link between the micro level Unit theory and the macro level can be easily accomplished through conducting the experiment called Schrodinger's cat. The Unit Theory version of this experiments states that there is a cat in a box, which is linked with a special device. This device contains a Unit, which has fifty percent probability of behaving in state A within an hour and fifty percent probability of behaving in state B. If the observed condition is A, poisonous gas will be released and kill the cat consequently, not if otherwise. During this hour of experiment, as the Unit is under the Quantum Superposition of both A and B. the cat is also under the Quantum Superposition of being both dead and alive, or logically equivalent, that the cat is neither dead nor alive. But when we make the observation, only one condition could be true: the cat is either dead or alive, not both.

After these two introductions, one may have already sensed the similarity between Unit Theory and Goedel's proof. In Goedel's proof, a well-defined formula is both true and false in the formal system if being assigned either value, while in the Unit Theory; the cat is neither dead nor alive. Since the formal system upon which Goedel's proof builds on is purely syntactical, we can therefore develop a special interpretation that relates this pure syntax with semantic meanings. This interpretation is therefore the formal representation of the Unit Theory

The formal system to which we assign the Unit Theory is the Typographical Number Theory (TNT). As a formal system, the Unit Theory naturally satisfies the pre-conditions for Goedel's theory. Let us assume that variable y denotes the object under Quantum Superposition, and q as the poor cat in the experiment. Therefore, when we talk about the condition of the cat, we are in fact substituting the variable y with q (or rather an instantiation). Let function f(y) returns 1 if it is provable in TNT that sub(y, 33, y), 0 if otherwise. As shown previously, if sub(q, 33, q) is provable, sub(q, 33, q) is refutable, which gives function f(q) 1 and 0 at the same time. Further, if sub(q, 33, q) is not provable, then sub(q, 33, q) is provable, which again gives function f(q) the value of 1 and 0 at the same time. Let as assign function f(x) the semantic meaning of “the condition of the object” while 1 denotes being alive and 0 being dead. What we have now is the following: f(q) = 1 iff sub(q, 33, q) is provable or f(q) = 0 iff sub(q, 33, q) is not provable. In previous steps, we get both f(q)=1 and f(q)=0 at the same time, which in ordinary English reads as “the cat is both dead and alive”. This inconsistency may be absurd in Mathematics, but it has real meanings in the Unit Theory. It is rather a necessary condition for Unit Theory to be legitimately presented in formal system. This “problem” of a formal system in fact has real meaning. It reflects the indeterminacy of the future world line, and this indeterminacy is installed by nothing but the randomness of Units and of causality.

However, our inquiry shall not end here. As we assert at the beginning that the formal system used to represent Quantum Physics is TNT, which entails that the formal system is consistent, it cannot contain a proposition that consist both a statement and its negation. Thus the function sub(q, 33, q) is neither provable nor refutable. It must be undecided, making f(q) neither 1 nor 0, or “the cat is neither dead nor alive”, which is exactly what the state of the cat is before the observation. In macro-cosmos level, we shall denote the set of TNT as the cosmos C. We shall also denote set D as the definite cosmos, where D is obtained by D= TNT – {x| x is a Goedel sentence}, that is, eliminating (subtracting, in Set theory terms) the Goedel sentence from the TNT, making the remaining system (set) decidable. This set D is intended to include all decidable formulas that are also consistent. However, this intention could never be fulfilled as long as D could still support some proportion of arithmetic, for the general abstraction of Goedel's first theorem dictates that all such sets (D) must contain some well-defined formula that can neither be provable nor refutable as long as the set is consistent. We cannot therefore obtain the set D, not because we cannot determine what is provable in system of D (or elements of set D) but rather because we cannot determine elements that do not belong to D. To elaborate on this for a bit, we can re-write the criterion of set D as "for all x, x belongs to D iff x is provable in TNT." Since TNT is semi-decidable, we can produce the provable elements of set TNT in a mechanical and effective manner. However, we cannot mechanically produce elements of set TNT that are not provable due to its semi-decidability. Therefore, we do not know what undeterminable propositions should be subtracted from TNT, and we could never exhaust non-provable formulas from TNT: there are infinitely many non-provable formulas in TNT. As a consequence, we cannot use enumeration but only an algorithm to deplete them. But such algorithm could never exist, for there is no way to use syntax in TNT to determine which formula is non-provable. In this sense, the set D is only recursively enumerable. That is to say, upon seeing a proposition, we can decide whether it belongs to D or not, but we could never use any algorithm to systematically find out everything belongs to this set. In real world representation, if we denote D as the definite known world, this result would yield an interesting interpretation: the process of enumerating propositions is the process of making observations. Each proposition corresponds to a real world phenomenon, and the set D represents the known (observed/past) world, while the set to be subtracted includes all superpositions of which the observation is not yet made.

In the previous discussion, we talked about different world lines, and how we could shift from A-B to A-C, for instance. However, it is reasonable to ask what happens to all other world lines once we enter a specific line (make an observation). That is, whether other world lines collapse or they still exist. The former is supported by the Copenhagen School while the latter is supported by the theory of Parallel Universes. In the section of the General Unit Theory, we claim that it is compatible with the Copenhagen School. However, the adoption of the formal system as the representation could actually lead to reconciliation between these two schools. The Copenhagen school claims that other world lines would collapse upon observation. In essence, this states that upon observation, the actual state of the cat will transform into one definite result from the superposition. In formal system, this can be paraphrased as assigning either sub(q, 33, q) or ~sub(q, 33, q) as an axiom in TNT. As we know, asserting sub(q, 33, q) as the axiom cannot avoid the grasp Goedel's theory. The new TNT still consist of formulas that can be neither proved nor refuted. In interpretation, this assignment asserts the final condition of the cat. It does not assert the result of other superpositions. Moreover, as it only assigns one side, the system is still consistent, and is applicable for Goedel's theory (again). However, the assignment of ~sub(q, 33, q) would make the system inconsistent. On the one hand, it proves sub(q, 33, q), on the other hand, it denies every natural number to be the

Goedel number of such proof. That is, one cannot find a natural number such that it is the Goedel number of the proof of sub(q, 33, q). It is only a supernatural number P that serves as the corresponding Goedel number of our proof. And this supernatural number P is larger than any natural number (it must be infinitely large). This number, P, is the key to our reconciliation.

To clarify on the reconciliation, we need firstly discuss the interpretation of the formal system for the School of Parallel Universes. This school states that both A-B and A-C exist after observation---the universe split into two parallel ones: one with a living cat while the other has a dead cat. The observer will know that he enters the universe of a living cat if on observation, the cat is alive, and he will know that he enters the universe of a dead cat if otherwise. In this case, we have two parallel formal systems, denoting as TNT1 (the consequence B of the world line A-B) and TNT2 (the consequence C of the world line A-C). Each is obtained by assigning either sub(q, 33, q) or ~sub(q, 33, q) to the original TNT (initial condition A—the existing cosmos) system. Moreover, since there are an equal number of elements in the set of TNT and the set of TNT1, we can form a one to one (and also onto) mapping between two sets. We call this mapping (function) as function 1 (a five dimensional movement from A to B, forming the world line A-B), denoting as f1. Similarly, we can also get f2 which is a one to one (and also onto) function between set of TNT and of TNT2 (similarly, it is actually world line A-C). Upon observation, the observer will move into both f1 and f2 (thus forming parallel universes. In some sense, this is no longer “the observer” anymore: he splits into the observer in B and the observer in C), however, as these two sets (set TNT1 and set TNT2) are incoherent, there is no inter-universe transmission (a fifth dimensional movement, which is infeasible for humans), making the observer in each universe only aware of one outcome.

Now let us return to the Copenhagen School, the second condition is in fact a narrow version of the parallel universes scenario: it features what an observer in one of the parallel world faces. There is a world where sub(q, 33, q) is provable, however, no natural number can be assigned to such proof as the Goedel number. It means that this scenario (say, the cat is alive) is infeasible (P is infinitely large: larger than all possible natural number) in this world where under no condition (no natural number) this cat is alive. The inaccessibility of sub(q, 33, q) reflects exactly the assertion of parallel universe hypothesis that observers in each world line cannot communicate with each other, making them only know one result. In this interpretation of the formal system, there is no essential disagreement between these two schools. The Copenhagen school is accountable for the observer in one world line (a four dimensional explanation), while the parallel universe hypothesis concerns all observers in all world lines starting from A (a sixth dimensional explanation).

So far we have addressed the special interpretation of the formal system TNT that could be adopted in describing the Unit Theory. We have also shown that Goedel’s theory does not appear to be a threat, but in fact a necessary condition for the compatibility between any formal system and the Unit Theory, as this theory reflects the very core idea of randomness. Furthermore, we have shown that the special interpretation could bridge the gap between two opposing schools. All we have done in this section states that the inadequacy of a formal system has real meaning if assigning Unit Theory as an interpretation of the formal system: it is but the core idea and the immediate result of the Unit Theory. The similarities between the Unit theory and the formal system indicates that it is possible to form an isomorphism from the Unit Theory to a formal system, which opens the possibility of using a formal system as a sufficient "carrier" of the Unit theory.

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