Parallel universes and causal anomalies: links between science and religion

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Abstract

In [6] it was proposed to define "god" as a region of a universe that is subject to circular causality. While we do not adapt the exact definition of "god" that is being introduced in that paper, we do accept the concept that "god" has something to do with causal anomalies: either circular causality or else two competing causal structures. We will show that the presence of a causal anomaly (whatever it happens to be) might allow us to define trinity in non-contradictory way. That is, we will show how the members of trinity can be separate entities and, yet, have the same identity.

1. Introduction

When confronted with the question of reconciling science and religion, typically people end up making compromises on both sides. On the side of science, it is often claimed that since science can't explain *everything*, there is always room for God. And, even worse, it is often claimed that the scientific evidence for old Earth is not sufficient because some details are not yet understood; this view is very biased since it ingores the overwhelming evidence in favor of the old Earth. On the religion side, on the other hand, it is claimed that bible is not to be taken literally. The seven "days" are often interpretted as the time periods of undefined length that whose definition as "days" is only figurative. This view, again, is biased since none of the other parts of the bible are allegorised to that extend.

In this paper I will make an attempt to be more loyal to both science *and* religion. Thus, I will make "extreme" assumptions on both sides that would make the process of reconciling these two disciplines as difficult as possible. I will then go ahead and show the way of reconciling them *despite* these assumptions. In particular, I will assume the following:

a) Both science and the bible are a hundrid precent true

b) We understand *all* of scinece, and the science we understand is completely deterministic. Any appearance of quantum probabilities is accounted by deterministic hidden variable theories.

c) Science proves consclusively, without a shaddow of the doubt, that the Earth is old and the universe developed within several millenia

d) Bible proves conclusively, without a shaddow of the doubt, that the Earth is young, and the creation took place in 7 days

In accomplishing this goal, I will follow the idea presented in [6] that the key concept behind the religion is the existence of causal anomalies. While the particular causal anomaly that I introduce is not the same one as the one proposed in [6], I believe that *any* kind of causal anomalies is a good source to find answers to questions about science and religion, and there is definitely a lot more ground to explore. In my case, I will adopt a view proposed by Nikolic in [5] and claim that our four dimensional universe "evolves" in some other time dimension. Thus, the "internal" time dimension looks like a "space" one when it comes to the above evolution in a "true" time dimension. This will give a room to think of "time coordinate" and "true time" as two different times, thus introducing two different causalities.

As far as the age of the Earth is concerned, I claim that it is both "old" and "young" at the same time since competing definition of causality will lead to competing definition of time. Both of the definitions of causality are well defined mathematically. Thus, I do *not* claim that the definition according to which creation took place in seven days is any less literal than the one according to which the Earth is old. Furthermore, both causalities are consistently defined for *all* times, not just the time of creation. I then show, starting from the general concepts that I propose, *why* these two causalities "disagree" with each other when it comes to early universe, but start to "agree" more and more when we looking at less distant past.

Likewise, I claim that multiple causalities can reconcile scientific determinism with biblical freedom of will. In particular, I claim that in one of the causal directions we have complete determinism, while in the other ones we do not. Incidentally, the notion that determinism coexists with freedom of will follows straight from the bible itself. For example, the book of life is said to have been written "from the foundation of the world"; yet, people's names can be both written and blotted out from it. Bible, likewise, promotes the idea of multiple causalities as well. For example, the lamb was "slain from the foundation of the world"; yet, the crucifixion event took time during the first century. Jesus came "after" John the Baptist, but "was prefered before him", etc.

Furthermore, I claim that multiple causalities can also account for other biblical paradoxes, including trinity. I present a model in which the number of "persons" is strictly based on the causal structure we used. Thus, multiple causal structures lead to multiple ways of counting the number of persons in trinity: we have one God according to one causal structure and three gods according to the model of multiple ones.

It is important to emphasize, however, that I don't claim to *prove* the existence of God or validity of the bible. I simply claim that the latter two things are *compatible* with science, just like the "atheist" point of view is. The purpose of this work is to provide a counter-example to a statement "science can disprove religion" by showing at least one way in which it does not. At the same time, however, I don't claim that science can "prove" religion either; but, of course, showing that science doesn't "prove" religion doesn't require any work since that is something most people agree with, anyway. Thus, the conclusion of this work is that science neither proves nor disproves religion; and neither does religion prove or disproves science. This allows one to freely explore each of these two disciplines without the fear of compromising the other one.

This point of view, in fact, does a lot of justice to science. It is a well known fact that one of the most beautiful things about mathematics is that *everyone* believes in it, regardless of their beliefs about anything else. Thus, by reconciling science with religion I am putting physics on the same level. That is why it is important to reconcile physics with literal, seven day creation, interpretation of the bible, since that will allow everyone to believe in physics, regardless of their biblical views. The rule of thumb is that whatever interpretations are more difficult to reconcile, the "better" they are, since that will automatically allow us to reconcile their "easier" versions as well. That is why the "deterministic" version of science (accounted for by hidden variables in quantum mechanics) serves my purposes better, simply because it is "more difficult" to reconcile it with religion.

2.An argument in favor of atheism

In my opinion, most of the arguments on either side of a table have one weakness in common: they do not acknowledge the opposing view. Therefore, in order to make stronger case, I will start off by presenting an argument *against* religion, and show how science can, in fact, explain the existence of living organisms without resorting to creationism. After that I will move on to talk about the "missing gap" (which I claim to be human consciousness) and, finally, I will use that missing gap to argue in favor of religion.

One of the most compelling arguments against the creationism is that, from the point of view of classical physics, a human being can be completely described in terms of configuration of particles. Thus, if we know the locations of all of the particles in the universe, we can predict the way they will move later on, thus we can predict the person's behavior which negates freedom of will. This argument, of course, does not hold true quantum mechanically; but if we believe in hidden variable interpretation of quantum mechanics, this will continue to be true even then.

There is a school of thought whose adherents accept the above arguments but, at the same time, insist that we still need an "intelligent" God in order to create an "original" configurations of particles that "works" so well. The analogy that is commonly used to make this point is the one of a watch. We all agree that a watch is ran by deterministic physical laws, and does not need any outside interference from humans. But, that same watch needed to be built. Thus, the role of the human is to build a watch. Once the watch is built, the human is no longer in the picture. It is commonly argued that our universe is similar to the watch, while God is similar to watch maker. Thus, God created the universe;

but once the universe was created, He has no further role.

It can be argued, however, that God didn't have to create the universe, either. Probability theory tells us that if we throw a coin infinitely many times, then we would be able to produce any finite pattern we think of with absolute certainty; it doesn't matter how large that pattern is, or how clever it is. Thus, if our universe has infinite size, and the particles are left to obey physical laws, then within some location of the universe, the particles will, by accident, line up in such a way as to produce living organisms. In fact, this will happen in infinitely many locations, with absolulte certainty.

Even if there is some scientific evidence regarding a finite size of the universe as well as its finite age, the above argument can still be made. It is still possible that there are infinitely many "parallel universes" that don't interact with each other. Thus, due to the fact that the *collective* volume of these universes is infinite, in *some* of them the life will be produced with absolute certainty. Now, the vast majorit of the universes, where life failed to be produced, do not have any human observers to witness it. Thus, the "observers", which need to be alive, happen to reside in the ones where the "accident" did happen. This, in fact, was one of the arguments that was used in favor of some versions of string theory over the other ones.

Going back to the question of determinism, from the point of view we are considering, when a human makes a "choice", two things happen. First of all, the configuration of particles generates a "feeling" that corresponds to "making a choice". Secondly, this same configuration corresponds to the motion of the body according to that "choice". Thus, a human learns, by experience, that whenever he has a certain feeling it always follows by the motion of his body; thus, he decides that the feeling is a "cause" and the motion of the body is an "effect", which implies that he made a "choice". In reality, however, both the feeling and motion of the body are "effects", while the cause is configuration of particles. This means that he has no "choice" about the way his body moves.

Thus, if by some miracle, his feeling *happened* to make him want to make another choice, he would be confronted with the fact that he is "forced" to move contrary to his feeling. But, due to the fact that feeling, itself, is dictated by the configuration of particles, this never happens. Thus, he never gets confronted with the fact that he has no control over the way his body moves, since every single time his body is "forced" to move a certain way, he "happened" to want it to move that exact way. Thus, he continues to have a false belief that he has a freedom of will.

The fact that a given person is forced to move in a certain way can be explained through natural selection: species need to behave a certain way in order to survive. The "survival" has nothing to do with consciousness that makes them "want" to survive. The species can be robots that lack consciousness altogether. Even then, after the time passes by, we will only be able to find the robots that survived. The ones that did are the ones that, *by accident*, happened to have a setup that makes survival more likely. That setup makes the robots *behave* as if they have consciousness, while in fact they don't.

The fact that we communicate to each other that we have consciousness can also be explained in terms of survival. Both humans and animals can survive better in groups, and the communication of "information" promotes the survival. But, the latter does not have to involve consciousness: robots or computers can also communicate "information" in order to perform complex task. Of course, our communication of everyday feelings does not directly promote the survival. But, from the point of view of natural selection, the "setup" that promotes the communication of information does not have any purpose; it just *happened* to promote survival *by accident*. Thus, the "robots", accidentally, happened to have a setup that encorages them to communicate information; this setup happened to allow them to survive, which is why they are still here right now.

In light of the fact that communication of information is performed strictly through the configuration of particles, there is no way to be convinced that other humans or animals actually have consciousness. The fact that they *talk* about consciousness might be just a consequence of the specific configurations of particles. In fact, even the fact that I am typing this paper about consciouness might also be a consequence of configuration of my particles that happens to move my fingers in a certain way. Likewise, if someone understands what I am talking about, there is no evidence that they understnad in terms of actual consciousness. The only evidence is the words that they either speak or type; both is just a motion of particles and, therefore, both can be attributed to physical laws, without them actually having a consciousness.

True, we do have a consciousness, but we can not prove that we do based on what we say. It could have happened that we didn't have consciousness, and even then we would still be saying that we do. And, even worse, it could even happened that we had consciousness that was telling us to hurt ourselves. In this case, because of evolution, physical laws would *still* make us *not* hurt ourselves and the "forced" motion of our body would no longer be consistent with our "choice" to hurt ourselves. In this scenario, our *communication*, which is based on physical laws, would continue to be consistent with us *not* wanting to hurt ourselves. So the *actual* consciousness that wants to act contrary to what physical laws makes us do will remain completely undescoverable.

Now, I know, first hand, that I don't want to hurt myself; and, in fact, all of my conscious choices are consistent with the way I actually behave, which is consistent with serving my needs. But, even if that was not the case, my fingers would still have typed exactly what they did, due to physical laws. Thus, I just know that in my case I am "lucky" to have this kind of consciousness, but I can't convince anyone else that I do; nor can I be convinced that other people have that kind of consciousness, either. I do have a *belief* that other people have consciousness consistent with my own; but that is just a belief that has no proof. Nevertheless, even if I do stick to this belief, I can still maintain "scientific" point of view by claiming that consciousness is a "passive" substance being "produced" by a configuration of particles, but has no impact on it.

3. Consciousness: a missing gap that "religion" fills

In the previous section we have proposed a model according to which there is no free will, and the behavior of humans is determined by the interactions of the particles they consist of. As we did that, we were facing a major issue: the configuration of particles produces consciousness, but the consciousness can not produce move these particles. Yet, as consciousness is *passively* being driven by the particles, it just *happens* to make a person *want* to do whatever his particles *make* him do. Furthermore, since his communication is completely determined by the location of the particles, the words to the effect that a given person posesses consciousness does not prove that he, in fact, does. We only have to take it on faith vaue that he does.

However, the "science" that produces consciousness is very bad. First of all, it does not satisfy the superposition principle: if there are not enough particles, there is no consciousness; but once the particle reach a certain configuration, the "consciousness" is produced. Clearly, its existence can not follow from any of the physics equations since none of their ingredients include it. Furthermore, the production of consciousness is non local. After all, it is produced by complex configuration of particles in the brain, and, therefore, it can not be described based on the field configuration at one point. If we are desperate, we can resort to higher order derivatives and, thus, reproduce global field configuration based on Taylor series around the point. In my opinion, however, resorting to this kind of technique is cheating since it can reproduce any kind of nonlocality what so ever.

This means that as far as consciousness is concerned we can no longer use an argument that "science explains it all, therefore, there is no room for God". Therefore, a logical room for either God or freedom of will is human consciousness *as opposed to* the motion of human limbs. In particular, God's role might be to "look" at the configuration of particles in a brain and then "tell" a person what he should feel, based on that configuration. Since God is "smart", He calculates the exact way in which the person's particles will move a second later, and then "tells" a person that the latter, presumably, "wants" to move in the exact way he is about to.

It should be pointed out that, while we have successfully given God an active role, what we said so far still does not imply a freedom of will. A person still moves in exact way his particles are configured, and his consciousness still something passive, without any active role. The only difference is that the "passive" consciousness is being "moved" by God as opposed to some scientific laws. There is, however, one more lose gap that *might* in fact produce the freedom of will. That gap is parallel universes.

We recall that, at some piont in the previous section, we have asked ourselves how can such clever "mashines" as humans be produced without an intelligent creator. Our answer has been that if the size of the universe is large enough then at some point of the universe the particles will accidentally line up in a desired way. However, we then asked what if the size of the universe is *not* large enough? Our answer to that question was that we might have a large set of parallel universes. In few of them the living species "by accident" developed, while in most they haven't. Now, the "consciousness" is produced only within the few universes where the living species did develop. Thus, these are the only universes that can be "observed" by us.

However, we have noticed earlier that the link between configuration of particles and actual consciousness (as opposed to behavior) is a bad science, and we claimed that things would look "better" if gaps like that are filled up by God in one way or the other. One way to follow this philosophy for the situation of parallel universes is this: we assume that a given individual had "consciousness" to begin with, and that consciousness existed outside all of the universes. Then, the "intelligent" God looked at various universes, "found" the one where life has been produced "by accident", and "directed" that consciousness to "go" to that particular universe and come inside of one of the brains of the species living there.

This, in fact, is consistent with religious view that the soul (which is a source of consciousness) is originally outside a body and then it is inhabitted by one. Thus, according to this view, a "heaven" exists outside of the parallel universe, which is why it can not be located in the physical world. Then, when a soul is "incarnated" into a physical body, it is first incarnated into a universe in which a body resides. Thus, in principle, it can have a choice as to which universe it wants to be incarnated into, which is one source of "freedom of will".

On the first glance, it seems like this choice is prohibitted by religion, if we stick to traditional religious views that we are the only people out there. Upon closer look, however, there is a middle ground. It is possible that the *unique* world in which we live in consists of several universes all of which are similar to each other on coarse grained level. Then, as they evolve, by "butterfly effect" the difference between them increases, so we are forced to "get rid" of some of them. Now, the decision as to which universes to "get rid" of is collectively made by God and all of the souls. This implies that each soul *does* have a capacity of "moving" objects: at any time t, it selects universes in which the coarse grained picture at $t + \delta t$ is the one a soul wants. If the soul is not "smart enough" to predict the evolution within each universe, it can always use God's help to do that.

The above argument assumed three dimensionanl universes, evolving in time. Now, if we want to stick to a four dimensional picture, that argument can still be made, in a modified version. In particular, from four dimensional point of view, it makes sense to say that all four coordinates, including t, are "space" coordinates, up to the minus signs in the metric. There is, however, a *true* time τ, inside of which these worlds "live". As τ progresses, the soul travels in t direction according to the trajectory $t = \tau$. And, at any given τ, it only sees $t = \tau$ section of the "universe".

Now, at any given time τ, the selected universes are "similar" on coarse grained level as far as their $t \leq \tau$ regions are concerned, but they are different on their respective $t > \tau$ regions. Thus, when τ changes to $\tau + \delta\tau$ a selection of universes has to "narrow down" so that they are similar at $t = \tau + \delta\tau$ as well. Strictly speaking, the new set of universes is a subset of the old one. But the specific choice of that subset will lead to the specific motion of the observed objects. Thus, if a soul plays a role in making that choice, then it has a power to move objects.

Now, the reason the soul can not move inanimate objects is that they are simpler than human brain; thus, their "butterfy effect" is much smaller. As a result, all of the universes agree regarding the future trajectory of inanimate objects, unless in some of them the latter were physically moved by the alive ones. On the other hand, alive objects, due to complexity of their brains, are subjects to much stronger butterfly effects, which is why the soul does, indeed, has a choice regarding these. In principle, the soul could move several alive objects at the same time, but God constrained its choices to just one object, while the choices about other objects is performed by other souls.

Now, we have to be a little bit careful. If each soul makes its own independent choice regarding a selection of "smaller" set of universes, it is possible that one soul will travel to the universes where a given set of alive objects moved in one way, and another soul would travel into a selection of "smaller" universes where a given set of objects moved in another way. Thus, we have to devise a model in which the souls "collectively" select a subset of universes, while each of the souls has enough "freedom" in producing relevent input into the selection process. The exact model that accomplishes it will be discussed in the next section.

4. Parallel universes and freedom of will

In the previous section we came up with a motivation for a qualitative picture where we have a set of parallel universes, each ran by deterministic laws, and the soul makes a "selection" between these universes and, thus, exercizes the freedom of will. In this section we will give more mathematically precise model of what is going on. On top of this, we will describe how several souls (or, what we will call "choice making agencies) can make a collective choice of universes, without contradicting each other.

We can think of the "universes" in the previous section as a separate hyperplanes of one "bigger" universe. The latter is described in terms of *five* coordinates, with extra coordinate, x_4 corresponding to an index of a given universe. Thus, the union of all these universes is described as $(x_0, x_1, x_2, x_3, x_4)$, while each specific universe is its $x_4 = const$ hyperplane, which can be described as (x_0, x_1, x_2, x_3).

Each such hyperplane, itself, is a manifold. Thus, if we identify x_4 with α, we have a set of uncountably many manifolds, $\mathcal{M}_\alpha$. In general, it is possible that the manifolds are replaced with more general sets S_α, which might be either unconuntable, or countable, or finite. Likewise, the parameter α might be either a real number or it might be restricted to integers, depending on what theory we are working on. For the purposes of this paper, we will be deliberately pluralistic in our views, since we do not want the idea of reconciling science and religion to depend on the validity of some specific theory.

Now, we introduce a global time, τ. This global time is not to be confused with *either* x_0 *or* x_4. x_0 is simply a part of a geometry of S_α for any given α. Thus, it is really a "space" paramete that *looks* like time due to the minus signs in the metric. x_4, on the other hand, is identified with the index α, or, in other words, the "name" of a manifold (or, equivalently, a name of a universe) we are looking in. Since all universes, with all "names" exist "simulteneously", x_4 is *also* a "space" parameter. Yet, in some respect, it might also *look* like time, since the choice of a subset of values of x_4 by choice-making agencies can be used as a "clock" to measure time. Yet, unlike x_0, we can *not* say that the "future" is characterised by either greater or smaller values of x_4. Thus, in this partiuclar respect, x_4 looks more like "space" than x_0. On the other hand, τ is a *true* time, in which our "false" times (x_0 and x_4) have freedom to "evolve".

For any fixed α, the physics within S_α is completely deterministic with respect to the "time" parameter x_0 (which is the only time parameter within S_α). For example, if we are dealing with continuum spacetime, then S_α might be a solution to a set of differential equations, and the difference between S_α and S_β is solely due to the difference in initial conditions. Furthermore, within each S_α the initial conditions are *not* subject to change. Thus, nothing else is a subject to change either. Furthermore, we can assume that the "evolution" of each of the S_α under the "initial conditions" already happened "a long time ago" and is now complete. Thus, as far as we are concerned, both "past" and "future" exist "to begin with". There are two things, however, that *do* change with τ:

a) For any given S_α we are only allowed to "look at" the hypersurface $x_0 = \tau$. Thus, despite the fact that the entire manifold exists to begin with, we have a false perception of evolution in x_0

b) We "select" some set of universes we are "looking" at, and we don't "look" at any other universe. We have some set-valued function $A\colon \mathbb{R} \to \mathcal{P}\mathbb{R}$ (here, $\mathbb{R}$ can be freely replaced with $\mathbb{N}$ if the reader wishes to discritize what we are doing). Thus, for any given value of τ, $A(\tau)$ is a *set.* At any given τ, the universe S_α is selected if and only if $\alpha \in A(\tau)$.

Thus, we can summarize the above two statements by saying that we have a *static* picture in five dimensional, $(x_0, x_1, x_2, x_3, x_4)$ space. At any given τ, we are looking at the *part* of the picture defined by $x_0 = \tau$ and $x_4 \in A(\tau)$. In light of the fact that five-dimensional picture is static, the *only* sources of dynamics are non-zero values of $d\tau/d\tau (= 1)$ and $dA(\tau)/d\tau$; the latter are the sources of fictitious "time" natures of x_0 and x_4, respectively. While $d\tau/d\tau$ is "determined" to be 1, the value of $dA(\tau)/d\tau$ is left up to "choice making agencies" (or, in other words, both human souls and God). The latter is the one and only source of "freedom of will".

Let us now denote the internal time parameter, x_0, within each of the manifolds by t. We will denote the part of the universe S_α "to the past of" t by $P_t(S_\alpha)$ and "to the future of" t by $F_t(S_\alpha)$. Thus,

$$P_t(S_\alpha) = \{x | x_0 \leq t \; ; \; x_4 = \alpha\} \; ; \; F_t(S_\alpha) = \{x | x_0 gett \; ; \; x_4 = \alpha\} \tag{1}$$

In general, if we allow for black holes or other anomalies, the identification of x_0 with "time" might no longer work. So, we replace the above formulae with the conditions that we expect to continue to work even in more general cases:

$$S_\alpha = P_t(S_\alpha) \cup F_t(S_\alpha) \tag{2}$$

and, for $t_1 < t_2$,

$$P_{t_1}(S_\alpha) \subset P_{t_2}(S_\alpha) \; ; \; F_{t_2}(S_\alpha) \subset F_{t_1}(S_\alpha) \tag{3}$$

In light of the fact that we have chosen to use $\leq$ and $\geq$ sings instead of using strict inequalities, the "present" at t an be defined as $P_t(S_\alpha) \cap F_t(S_\alpha)$.

Now, in case of black holes the existence of the right choice of parameter t that satisfies the above properties might still be questionable. But, for the purposes of this paper, we will simply state that we assume there is a way of viewing black holes (or other things that might come along) in a way that is consistent with causality; the actual work to that effect is beyond the scope of this paper.

Now, as was said previously, at any given τ, the universes that are being selected have indixes $\alpha \in A(\tau)$. Their "past" is consistent on coarse grained level, but not their "future". This means that, whenever α and β are both elements of $A(\tau)$, we should have $P_\tau S_\alpha \approx P_\tau S_\beta$, for some suitable definition of approximation. After τ changes to $\tau + \delta\tau$, the new criteria will become $P_{\tau+\delta\tau} S_\alpha \approx P_{\tau+\delta\tau} S_\beta$, which is more restrictive than the former. Thus, it is reasonable to assume that $A(\tau + \delta\tau) \subset A(\tau)$ (or, in general, $A(\tau_2) \subset A(\tau_1)$ whenever $\tau_1 < \tau_2$).

Now, suppose there are n choice-making agencies. They, collectively, "select" $A(\tau)$ for any given τ. All of these agencies "agree upon" the selection of $A(\tau - \delta\tau)$ since the latter has already been made. Then, the agency number k makes its own selection of $A_k(\tau) \subset A(\tau - \delta\tau)$. Finally, $A(\tau)$ is selected according to

$$A(\tau) = \bigcap_k A_k(\tau) \tag{4}$$

In other words, each agency imposes its own "restriction" on $A(\tau)$, and then the actual $A(\tau)$ is selected in such a way that it satisfies all the "restrictions" imposed by all "agencies". The "restriction" of an agency number k is that $A(\tau)$ should be consistent with the "choice" the agency number k would like to make. At the same time, that restriction is lose enough to allow other agencies to make their own choices. Thus, different elements of $A_k(\tau)$ all agree that the agency number k made the choice that it did; at the same time, they disagree regarding the choices made by other agencies. However, the intersection of all $A_k(\tau)$ completely describes the choices made by *all* agencies, and thus it determines $A(\tau)$.

It is important to emphasize that when I mentioned in the previous paragraph that A_α "tells a story of what choice-making agencies did at time τ", I am not referring to the *actual* agencies, but rather to their *representations* inside of A_α. After all, different α-s disagree on what choices the agencies have made; but, in reality, each agency made only *one* choice. This means that the actual choice-making agencies are *outside* of *all* of A_α-s, and they make their selection of A_α based on whether or not their *represenetation* inside A_α made a choice consistent with the one they would like to make. Now, the *representation* of the agency inside A_α is simply a configuration of relevent particles, in a form of a body of "alive" object. These particles, however, do not have consciousness. The "consciousness" of the agency is strictly *outside* of A_α.

If one goes back to viewing time in terms of a parameter t, the determinism is preserved within each specific S_α for any given α: we demand that our collection of universes consists *only* of the ones satisfying some specified set of deterministic laws. There are, however, two different causalities. The "first" causality is the causality *within* each particular S_α ; *that* causality is describeable by *deterministic* laws that specify S_α based on its initial conditions. The "second" causality, however, is *across* different α-s which allows the choice-making agencies to select the α-s they want. While greater or smaller values of α are *not* apriori "after" or "before" the other ones, the subsets of the sets of α are, in fact, "after" the larger sets. That, second, causality does not have the determinism that the first one has. Finally there is a third causality in the actual time τ; that one is not deterministic either.

It is possible to represent it as linear causality: "first" we set initial conditions for *all* S_α. Then we "waited" for each of S_α to "evolve". While we "waited" we set a watch, which also runs by deterministic laws, so that at some point the watch will tell us to "stop" so we obtain some set of finite universes and won't need to "wait" any longer. Then, "after" the watch told us to "stop", we then ask the choice-making agencies to walk into the room, and then we only allow them to "look" at the parts of the "universes" they are supposed to make a "choice" about.

Thus, at the beginning, they are only "looking" at the "earliest" parts of the universes (where I use the parameter t to define the word "early" or "late") and choosing their selections of *entire* manifolds *only* based on those, earlier, parts; then, after their selections are made, they are asked to "look" at the next-to-earliest parts of the universes that they have selected, and make further selections *within* the selected subset, based on those; and so forth. Of course, any part of the universe has the record of "earlier" history in the "memories" of the "representations" of the agencies; thus, they are effectively "looking" on the entire past, but not the future (that is due to the increase of "classical" entropy with t within any given universe, due to the fact that the "initial conditions" of the *deterministic* laws within any given universe are given in terms of earliest possible t, what we call $t = 0$). In reality, the latest parts of all these universes was already generated *before* they were asked to walk into the room; they are just not allowed to see it yet. Thus, the causality is perfectly linear.

Nevertheless, despite the fact that the above argument works in favor of linear causality, the way we define it is rather arbitrary. For example, instead of "waiting" until we abtain the "complete" universes before letting the choice-making agencies into a room, we can instead just wait until the "earlier" parts of these universes, $P_{t_1}(S_\alpha)$ are completed (where by "earlier" we mean earlier in terms of t); then ask the characters to make their choices within the "earlier" parts, and then continue our deterministic processes to complete next-to-earlier parts, $P_{t_2}(S_\alpha)$, allow characters to make choices based on those, and so forth. This, again, will be linear causality, but different from the one that we have.

The freedom of choosing different versions of linear causality is reminiscent to the freedom of choosing different coordinate frames in relativity. In the latter case, the answer accepted by causal set theory community is that there is no such thing as a "true" coordinate frame, altogether; instead, there are "true" causal relations. The definition of a frame is up to the interpretation of the observer. Clearly, this is guided by the philosophy that "true" parameters can only be defined in a unique way for any given situation, while "fictitious" ones can be defined in multiple ways. But in our current context, causality, itself, can be defined in multiple ways. Thus, if we are to be consistent with that philosophy, we should say that the causality, itself, is absent; and, instead, there is *double causality.*

Furthermore, from the causal set point of view, the causal structure $\prec$ is considered to be a part of geometry (this is motivated by an observation made by Malement and Hawking in ***** that both topology as well as a metric up to Weyl scaling, $g_{\mu nu}/|g|$ can be recovered from the knowledge of light cone causal structure $\prec$). In our case, we can argue that both t and α are part of geometry, while τ is not. After all, the only thing that changes in τ is the region where the *passive* choice-making agencies are "looking at". Thus, if we adopt the causal set perspective that $\prec$ should be part of geometry, then we are forced to define $\prec$ in terms of "fictitious" times t and α, rather than the actual time τ. This would imply the double causality.

5. Seven day creation

Up till now we have shown that some of the fundamental notions of religion in general, such as freedom of will, can be accounted by the alternative notion of causality. We have seen with our modified causality, that we now have three time dimensions (t, α and τ) instead of just one. The fact that we have more than one "time" suggests a possibility that creation might have been 7 days according to one "time" and several millenia according to another, thus reconciling "young earth" and "old earth" views.

Some people promote the "old earth" view based on the claim that the "days" described in the bible are not literal days, but rather some, undefined, longer time periods that are allegorically represented as "days". Apart from the fact that this view is not loyal to the literal interpretation of the bible, it does not adress all of the science questions, either. In particular, it does not adress the question as to why, according to the bible, the Earth was created *before* the stars. In what follows I will show how an appropriately designed elaboration of the previous section will adress both questions without a sacrifice to the literal interpretation of the bible.

As we recall, in the previous section we have postulated several "parallel universes", each having an index α. Each of these universes is a solution to a deterministic equation, where determinism is based on the internal time parameter, t. We then postulated some choice-making agencies (both humans as well as God) that are "outside" of these universes. They have some selection of "preferred" universes, that they keep "narrowing down" as the "true" time, τ, progresses.

This implies that, at a very early time, the selection of universes was so wide that they did *not* approximate each other on a coarse grained level (in other words, they might disagree about some macroscopical objects, including the locations of stars and galaxies). To put it more precisely, if α_1 and α_2 are both elements of $A(t)$, then the hyperplanes $P_t(S_{\alpha_1}) \cap F_t(S_{\alpha_1})$ and $P_t(S_{\alpha_1}) \cap F_t(S_{\alpha_1})$ approximate each other on a coarse grained level *only* if t is assumed to be sufficiently large. From the previous section we can deduce that the "reality" at an arbitrary time t is represented by

$$\bigcup_{\alpha \in A(\tau)} (P_\tau(S_\alpha) \cap F_\tau(S_\alpha)), \tag{5}$$

where A is some set-valued function of τ. This means that the reality is consistent on a coarse grained level *only* if t is sufficiently large.

Now, in order to consistently describe matter for smaller values of t we have to "integrate" across different universes. For simplicity of an argument, we will assume the "classical" picture where the "reality" is defined based on some set of "classical" fields $\phi_k \colon \cup_\alpha S_\alpha \to F_k$, where F_k might either be a set of real (or complex) numbers, if a field number k is a scalar field, or a set of spinors if it is spinor field, or a set of vectors if it is gauge field, etc. This happens to be consistent with "field beables" proposed in some Pilot Wave models, such as [1].

Now, the fields ψ_k give us a description *within* each of the universes, Even though each of these fields is defined simulteneously for all of them, we could, if we wanted, separate it into several feilds, $\phi_{k;\alpha}(x) = \phi_k(x, \alpha)$, where $\phi_{k,\alpha}$ lives strictly within the universe S_α. But, since our "reality" is a selection of several universes (the ones satisfying $\alpha \in A(\tau)$) we need to define another set of fields, $\tilde{\phi}_k$, specific to that selection. In order to make this precise, we violate the reparametrization covariance and assume that there is a "preferred" way of identifying points "across" the universes. Then, we define

$$\phi_k(\vec{x}, \tau) = \frac{1}{\mu(A(\tau))} \int_{A(\tau)} d\alpha \; \phi_k(\vec{x}, t = \tau, \alpha) \tag{6}$$

where $\vec{x} = (x^1, x^2, x^3)$ is three dimensional spacelike vector, and by $\mu(A(x^0))$ is a Lebesgue measure of x^0. Or, in a discrete case, the corresponding equation is

$$\phi_k(\vec{x}, \tau) = \frac{1}{\sharp(A(x^0))} \sum_{\alpha \in A(x^0)} \phi_k(\vec{x}, t = \tau, \alpha) \tag{7}$$

In the above equations, we obtain four dimensional picture by "killing off" α and t degrees of freedom. If we had an indefinite integral, then α degree of freedom would be killed through integration. However, in light of the specified region of integration, that region preserves *some* information about α. But, at the same time, the latter is a function of τ (since we put $A(\tau)$ in the integration domain), thus we got rid of α dependence in favor of τ. As far as t, we, again, got rid of it in favor of τ by setting $t = \tau$ inside of ϕ.

Now, if different universes "disagree" regarding a location of an object at a given t, then, on the level of the integral, the three-dimensional object gets "smeared out" at the "true" time $\tau = t$. If all the universes agree on a coarse-grained level, we would not notice the "smearing". But, if they disagree on macroscopical level, then the "smearing" will become noticeable. And, if disagreement is large enough, then the object will be "smeared" throughout the whole universe. This means that its "density" at any given point will be very small. Thus, in our "human" language, that object would not exist.

Now, I claim that all universes that contain the "earth" on the first place, agree that it is old, *but* not all of them agree about the location of the earth on coarse grained level. *Some* do – in particular, the universes with indexed $\alpha \in A(t_2)$ happened to agree. But a larger set of universes, described by $\alpha \in A(t_1)$ (where $t_1 < t_2$) do not agree. This means that at the time $\tau = t_1$ the three-dimensional earth was "smeared out" throughout the universe. Thus, *on a level of an integral*, the earth did not exist at $\tau = t_1$. Then, at $\tau = t_2$, God was "looking" only at a small subset of these universes. Thus, the earth was no longer "smeared out" that far, and that is how it came into existence.

Yet another, and perhaps even stronger reason is this. While all the universes that actually contain the "Earth" in its current state agree that it is "old", most of the universes probably do not contain the Earth to begin with. On the other hand, some of the other universes might contain some planets that do not exist in ours. Thus, if we count *all* of them, then it would be very inconsistent to say that the Earth exists but that other planet does not. This means that, regardless of integration, the consistency of the language forces us to say that the Earth did not exist back at the time when the range of the selected universes was too wide.

Another point that should be adressed is the comparison of the constant rate of time evolution later on, with the non-constant one during the creation. According to the model, God is looking at $t = \tau$ *at all times*. Thus, $dt/d\tau = 1$, both during the creation and right now (in other words, I stick with a literalist view that the 7 days were, in fact, literal 7 days). The difference between then and now is that during the time of creation there were *two* sources of evolution: the progression in t as well as narrowing down the number of universes. Right now, on the other hand, narrowing down the number of universes has no impact on the physical processes on a coarse grained level (the only exception to this is freedom of will, discussed earlier). Thus, right now we have only *one* source of evolution: $dt/d\tau$. Since the latter is identically equal to 1, the today's evolution is "constant". But, during the creation time, due to the second parameter, it was not.

This specific mechanism of "reducing" the "smearing" of the Earth happens to agree with Genesis 1:2 where it says that the Earth was "formless" when it was first created. Not surprisingly, most people interprete the word "formless" in a sense that there was no plants or oceans, etc. But, in light of what we have just discussed, the Earth could have been formless in a literal sense: it could have been "smeared out". So, at first, it was smeared out throughout the entire universe and thats why it didn't exist at all. Then, later, it was smeared out througout some smaller region (possibly with the volume being twice larger than the one of the Earth), so it was "formless". And then, even later, it was no longer smeared out at all, so then it acquired a form; and that "form" included the oceans and plants since the latter was no longer smeared out either.

This also explains why, according to the bible, God first created the earth and then the stars. Just like all universes that have the Earth agree that it is "old", in the same way, they all agree that the stars existed several millenia *before* the Earth. *But* they couldn't agree just where should these stars be. When God was "narrowing down" the number of the universes, he *first* narrowed it down based on the criteria on them agreeing regarding the location of the Earth but *not* the stars. Thus, the Earth was no longer smeared out, but stars were. In other words, the Earth existed, but stars didn't. Then, later, he further narrowed down his choice of universes based on the location of stars, and thats how stars came into existence.

Now, we know from cosmology that the location of the Earth has everything to do with solar system and, less directly, other stars. Thus, it might seem odd that the different universes God first picked out agreed upon the location of the Earth but not the stars. The answer to this question is that there is that the number of the universes is large enough for Earth to *happen* to be in the same location in some of them *by accident*. This is similar to the fact that if one is to throw dice very large number of times, there will be 100 percent certainty that he will get any pattern he is looking for at some point in time. Thus, God, being an "intelligent" being, was "looking" for selection of universes where the Earth is at the same location, while stars are not. And, due to the large number of universes, he succeeded in finding it.

Let us repeat what happened with the Earth and stars in a bit more detail. We have several universes, and within *each* of the universes the stars came into existence first, and then the Earth came to exist millions of years later (where the words "first" and "later" in this sentence are referring to internal parameter t, *as opposed to* α or τ). In particular, this is true *both* for universe number α_1 (or S_{α_1}) *and* for universe number α_2 (or S_{α_2}). But, while S_{α_1} and S_{α_2} agree regarding the location of the earth, they disagree regarding location of the stars. Thus, as far as $S_{\alpha_1} \cup S_{\alpha_2}$ is concerned, the Earth existed, but not the stars. But then later on, as the "selection" narrowed down, S_{α_2} was "tossed away". While we still have several universes, they *all* approximate S_{α_1} on a coarse grained level. That is why, according to the current picture, we have both earth *and* stars, which is why the stars were created "later".

At the same time, *within* S_{α_1} the stars were still came into existence earlier, according to the internal parameter t. Thus, since the universe S_{α_1} is deterministic with respect to t, we can look at the *current* situation within S_{α_1} and, rightfully, deduce that in the past the stars were created before the Earth. Furthermore, since all other universes in the *currently* selected "collection" approximate S_{α_1}, their "collective" coarse-grained data is the same as the one of S_{α_1}. Thus, the latter, which is identified with current reality, will also tell us that stars were created before the Earth. This, of course, is also collectively true for the selected universes, since they all agree about the past on the coarse-grained level, just like they agree about the present.

It is important to emphasize that within the universe S_{α_2} which we have thrown out, the stars were *also* created before the Earth. In fact even the original, "large", collection of the universes "agreed" that stars were created first. But they "disagree" regarding the location of the stars. Thus, at any given location $\vec{x} = (x^1, x^2, x^3)$, most universes disagreed with a statement "there is a star at $\vec{x}$". Thus, their consensus was that "there is no star at $\vec{x}$". And, since this is true for *any* $\vec{x}$, they ended up "concluding" that there are no stars at all, despite the fact that they *all* agreed that there should be ones.

There is also one more question that needs to be adressed: between each of the "days", there is a verse "and there was evening and there was moring", which seems to require a sun; yet, God created a sun only on a third day. In light of what we said previously this has two possible answers:

a) Before the "third" day, the universes all agreed regarding the fact that a given part of the Earth was illuminated at a particular time but not at the other time. Yet, they disagreed regarding the location of source of illumination. Thus, the "integral" across α-s of the luminocity in the vicinity of the Earth was, in fact, large. Yet, that same integral of a "density" of a sun at any given point was small – after all, the sun was "smeared away". Thus, there was evening and morning without the sun.

b) It is also possible that in most of the universes the Earth was *not* illuminated. Yet, God knew ahead of time what universe he was *planning* to select few days later. Thus, he used the universes that we have today as a "clock" in order to decide when to do whatever he is doing within the larger set of universes. Now, suppose the luminocity that is related to evening and morning is L, but a significance God attaches to that luminocity is L'. Then, the integral across α of L is small (contrary to what we proposed in "a"). But, at the same time, the integral of L' is large. Thus, from the point of view of what is "significant" to God, there were in fact evening and morning.

Now, going back to the earlier things we said about "stars", this same logic can also explain the contradiction between scientific evidence that humans evolved from apes, and the bible. To make long story short, Adam and Eve are to the Earth in the same way as the rest of their contemporary humans *as well as* apes are to the stars. Thus, in each of the universes the evolution (in t) started off from apes, and then eventually humans came into existence. Science tells us that in each of these universes *several* humans came about from apes, not just Adam and Eve. But, when God was selecting the universes, he picked up the ones that "agreed upon" the location of Adam and Eve, and nothing else. That is why Adam and Eve were created "first".

Then, later on, when God decided to create animals, as "helpers" for Adam, these "helpers" included apes. This means that, finally, God decided to make a "smaller" selection of universes that also agree on the location of apes. Just like with stars, the apes came about *after* Adam and Eve only because God selected the universes that agree on their location *after* selecting the ones that agree on the location of Adam and Eve. But, within each of the universes (both the ones he selected and the ones he tossed out) apes came before Adam and Eve, and evolved into the latter over a very long time.

Now, science tells us that within each universe apes evolved into *many* humans, not just Adam and Eve. Thus, when God narrowed down the range of universes to the point that *nothing* is smeared out on a coarse grained level, other humans appeared "out of nowhere". That is why, for example, when Cain was expelled he was afraid of other humans harming him in Genesis 4:14.

6. God as a sustainer

In the previous section we have established that, both at the time of creation as well as later on, the choice-making agencies (which includes both humans and God) were narrowing down the selection of universes. During the creation the selection of universes was so large that narrowing it down had an observable effect. Later on, however, the selection of the universes is narrow enough for them to be "consistent"; thus, regardless of the way to narrow it down, our subsequent observations are consistent with prediction of science.

This, however, brings us back to one of our previous questions: how about freedom of will? After all, we were claiming that when choice-making agencies, which represent humans, narrow down the selection of universes, it *does* lead to observable changes of the motion of human bodies. Our answer to that question was butterfly effect. While the universes we selected at a time τ (with indexes $\alpha \in A(\tau)$) all agreed regarding the situation at $t = \tau$ *on a coarse grained level*, due to the microscopic disagreements regarding $t = \tau$, their disagreements are much larger at $t = \tau + \delta\tau$. This means that the selection of a subset $A(\tau + \delta\tau) \subset A(\tau)$ can *not* alter the coarse-grained picture at $t = \tau$, but it *can* alter the one at $t = \tau + \delta\tau$.

On the other hand, during the time of creation, the universes with indeces $\alpha \in A(\tau)$ did *not* agree regarding $t = \tau$, either. To make the point clear, let us use the word "initial conditions" to refer to the situation at $t = \tau$ and we use the word "the outcome" to refer to the one at $t = \tau + \delta\tau$. In this language, during the creation we had freedom to alter both initial conditions and the outcome, whereas right now we are only allowed to alter the outcome but not the initial conditions.

This, however, leads to a different question: since we can alter an outcome both at the time of creation *as well as* right now, we have a freedom to allow the outcome to be "fuzzy" by not being "restrictive enough" in our choice of $A(\tau + \delta\tau) \subset A(\tau)$. For example, if we select $A(\tau + \delta\tau) = A(\tau)$ (which we are allowed to do since every set is a "subset" of itself), then at a time $t = \tau + \delta\tau$ the humans and animals will, simulteneously, move in all possible directions conceivable. In light of what we said in previous section this is possible – in fact that is exactly what happened to Earth during the creation. What it means is that the animals and humans will be "smeared out" according to the integral formula that we used.

I claim that what prevents it from happening is that God makes a "choice" that restricts the possible selections of $A(\tau + \delta\tau)$ to the ones that are consistent at $t = \tau + \delta\tau$. This is consistent within the framework of our theory: we previously claimed that *all* choice-making agencies impose their *own* restrictions on $A(\tau + \delta\tau)$, and then $A(\tau + \delta\tau)$ will consist of universes that satisfy *all of them*. Thus, God, being one of the "choice-making agencies" is free to impose the "consistency" restriction, which prevents the physical objects from being "smeared out".However, God has to repeatedly make this "choice" over and over again at every τ. Thus, at some point God can stop making this choice. That, in fact, might be the ultimate mechanism for the end of the world.

7. Creation of physical laws

Up until now we have assumed that all of the "available" universes S_α are deterministic with respect to *internal* time parameter t. The role of God, as well as other choice-making agencies (humans and animals) is to impose *further* restrictions on the set of universes, by selecting some small subset of that set. This essentially means that there are two classes of restrictions: one is "physical laws", which have been imposed "from the very beginning" and the other one is the "initial conditions" that are continuously being imposed as the "real" time τ progresses.

Now, if one believes in a simplicity of the theory, then one would be lead to reduce the two classes of restrictions into just one. In this case, one would propose that physical laws were also imposed at some point in time, and did not have to hold before then. In other words, *unlike* what we were saying up until now, the set of "available" universes include the ones that do *not* obey the deterministic physical laws; in fact, only few of them do. Then, at some point in time, the universes that violate the prescribed laws were "tossed out". This, however, implies a possibility that God could have imposed a restriction based on probabilistic laws rather than deterministic ones.

One example of such set of restrictions is developed in [4]. Consider, for example, a biased coin, which falls with probability 2/3 on head, and with a probability 1/3 on tail. We can now consider the set of all possible four dimensional spacetime "histories" with all possible ratios of heads and tails. We then "forbid" (or, equivalently, "throw away") all of the histories where the ratio between heads and tails is either less than $2-\epsilon$ or greater than $2+\epsilon$ for some specified finite, but small, number ϵ.

Thus, according to this model, the ratio of $2+\epsilon/2$ is just as likely as $2+\epsilon/3$, since neither of them are "excluded". On the other hand, the ratio of $2+\epsilon+\epsilon\delta$ has probability 0, just like a ratio of, say, $2+2\epsilon$, or even the ones of 3, 4 or even 1000 would. This is true, regardless how small ϵ and δ are. Thus, on a level of the entire universe there are no probabilities; we simply haves so-called "preclusion principle" in a very exact form. But, on a level of smaller subsystems this does, in fact, lead to probabilistic laws. If we don't know the number of heads or tails outside of a given small region of the universe, we can safely anticipate, based on the above preclusion principle, that the probability of finding a head within that region is, indeed, 2/3.

If we stick to the view of parallel universes described in this paper, this principle is deterministic with respect to τ but not with respect to t. As far as τ is concerned, at $\tau = 0$ we started off with a set of universes, some of which satisfy the above preclusion principle and others don't. Then, at a time $\tau = 0 + \delta\tau$ we got rid of all the universes that do not satisfy the "preclusion principle" and retained all the universes that do. Now, if God was not interested in "creation" and human agencies were not interested in exercizing their freedom of will (the latter two are the sources of lack of determinism in τ), then we simply no longer "narrow down" our set of universes after that. In other words, $A(0+\delta\tau) = A(0+2\delta\tau) = ... = A(\tau_0) = ...$ (while, as we said before, $A(0) \neq A(0+\delta\tau)$, but their relation is defined by the "preclusion principle). This will reproduce a set of "parallel universes" all of which obeying the quantum probabilistic laws; yet, they will be reproduced in *deterministic* way.

However, despite the fact that there is determinism in τ, there is *no* determinism in t. After all, if we know the initial conditions at $t = 0$ within a given S_α, we can *not* find out the geometry within a given S_α for $t > 0$. This is in direct contradiction to what was done in previous sections. Back then we were assuming that the only "available" universes satisfy (as opposed to probabilistic) laws *with respect to t*. Thus, as far as previous sections are concerned, we *are* able to deduce what happens at $t > 0$ based on what happens at $t = 0$ within any given S_α. We were assuming that the only source of uncertainty was the choice of α. But, from what we are saying in this section, it is possible to *not to* have determinism within a flow of t *even if* we the value of α is fixed.

The justification for the contradiction between this section and all the other ones is the following. We don't know the way things really work. The goal of this paper is to simply come up with some examples of how things *might* work. In other words, I am trying to counter a claim "religion is impossible" by comming up with some counter-examples, where it is "possible". While, strictly speaking, we only need one counter example, in practice different people might have different philosophies. Thus, the more counter examples we have the better, since that would raise the chances for *at least one* of the counter-examples to be compatible with a philosophy of a reader.

Thus, in the previous sections we have shown that *even if* we insist on determinism in t, it is still compatible with a freedom of will. Then, in this section, we have shown that we don't need a determinism in t, after all. Thus, the total message is that science aind religion is compatible, period. But even if we want a *luxury* of having determinism in t (which we don't really need) they are *still* compatible. This case is much stronger than the ones that is often put forth by Christian physicists where they try to quote Copenhagen interpretation of quantum mechanics (or some other arguments) to deny determinism in order to find place for God.

Nevertheless, if one insists in determinism in t, one can rewrite this section in a way that this determinism is accomplished. In particular, we continue to claim that *original* set of universes, at $\tau = 0$, contained the ones that violate physical laws. But our new claim is that at $\tau = 0 + \delta\tau$ God got rid of all the universes that violate *deterministic* laws with respect to t, *as opposed to* the preclusion principle we talked about earlier. This, again, implies a "creation" of physical laws, but, this time, deterministic ones. In fact, for the reasons stated in the previous paragraph, this will be the point of view I will take throughout the rest of the paper.

The other issue that needs to be adressed is that $A(\tau + \delta\tau) \subset A(\tau)$ is, itself, a "physical law"; yet, I was assuming that this law was not created by God but rather limitted Him, which sounds like "putting God in a box". This can be adressed quite simply: God did not have to obey this particular law. He *chosed to* obey it. As far as other choice-making agencies (such as humans and animals), they are *forced* to obey this law, by God. However, God can change his mind about this law at any time; he simply chooses not to.

This, of course, leaves a room for speculation that perhaps he wasn't obeying this law during creation, or that He would stop obeying it after the apocalypse. But, for the purposes of this paper, I will assume that he always obeys it. After all, it is *more difficult* to argue in favor of the possibilities of 7 days creation, or miracles, if one assumes that a certain law *always* obeyed. Thus, in this paper I will stick to "more difficult" task by making this exact assumption. After the "difficult" task is performed successfully, hopefully a reader can be convinced that the "easier" task (where the $A(\tau + \delta\tau) \subset A(\tau)$ is relaxed at some point) can be performed, too.

8. Miracles

The next question we would like to consider is the possibility of supernaturally moving inanimate objects, which was recorded in the bible. From what we said in the previous section, during the creation there was a freedom to alter both the "initial conditions" at $t = \tau$, and the "outcome" at $t = \tau + \delta\tau$ on a macroscopic level. Later on, however, as a result of the fact that the number of universes have been narrowed down, at any given τ, there is *only* a freedom of altering the outcome, $t = \tau + \delta\tau$, but *not* an initial conditions at $t = \tau$.

We have stated previously that the reason the possibility of altering the "outcome" without altering the "initial conditions" does not contradict determinism is that initial conditions are only known on a "coarse grained" level. Thus, due to the butterfly effect, it is possible that the universes S_{α_1} and S_{α_2} *roughly* agree regarding $t = \tau$ but disagree regarding $t = \tau + \delta\tau$. This means that the butterfly effect, or lack thereof, is a key as to whether or not the "choice" of the "choice making agencies" can have impact on the motion of physical objects (whether that be the bodies of humans or animals *or* inanimate objects). Now, our agenda is to explain the following facts:

a) Human (or animal) bodies can be moved "supernaturally" at any point in time

b) Most of the time the inanimate objects can not be moved "supernaturally"

c) There are some occasions when inanimate objects *can* be moved "supernaturally

If we will stick to our line of thought regarding butterfly effect, we have to make a claim that both human bodies and inanimate objects are subject to butterfly effect, but the one human bodies are subject to is much larger. Now, we *do* have a scientific evidence in favor of butterfly effect inside human bodies: if human bodies were "simple" enough for there to be none, then we would have conclusively disproven science based on freedom of will, a long time ago. Thus, our *scientific* belief is that human bodies are far more complex then inanimate objects and this is a root of butterfly effect.

We have to be a little bit careful, though. We know that human bodies can *only* move when brain sends a signal. Thus, strictly speaking, we do *not* have a freedom of will regarding our limbs: they move if and only if they received a signal from our brain. We do, however, have a freedom of will as to whether or not the brain actually sends that signal or not. Thus, we conclude that both human limbs, as well as inanimate objects, are "simple", so that there are no observable butterfly effects in these systems. Our brains, however, are complex,

This difference is probably due to the fact that human brain (or animal brain) is more complex than inanimate objects; thus, the former are more subject to the butterfly effect than the latter. After all, if a brain was "simple", then the existence of freedom of will would have easilly disproven science. The reason that it has not is, precisely, the complexity of the brain. Thus, it is logical to assume that the complexity of the brain is the source of the "butterfly effect" spoken about earlier.

Now, in order to explain "miracles" happening to inanimate objects we have to claim that these, too, are complex. This, in fact, is consistent with science. Classically, it is possible to set up the "initial conditions" of the particles in such a way that the object will at some point fly up; it is simply very unlikely. Quantum mechanically, this also has non-zero probability of happening from much more fundamental point of view. Since I believe in Pilot Wave models, I will use "classical" argument and claim that, even though evolution of beables is deterministic, the origiinal setup can lead to the beables doing something "crazy" at some point. In fact, this has to be true since any successful Pilot Wave model has to be able to correctly reproduce quantum mechanical amplitudes, which are non-zero.

Now, the subset of the universes that have "miracle" happening at $t = \tau$, for any given τ, is very small. Thus, if a choice-making agency is not "smart" enough, its selection of $A(\tau + \delta\tau) \subset A(\tau)$ will exclude that miracle with probability close to a hundrid percent. But, since God is, in fact, "smart enough", He can cleverly choose a selection of $A(\tau + \delta\tau) \subset A(\tau)$

to "arrange" for the desired "miracle" to happen. Now, of course, humans (such as Moses) might not be "smart enough" to do that. But, since God is "smart", He *chose* to perform a miracle *for* them. Now, if God chooses to perform a miracle for a given person only after that person chooses to pray (even if the prayer consists of just one word), it would look like the person performed a miracle; but, in reality God performed it for him.

9. Circular causality: a competing view

Up until now we have shown how multiple causality can explain some of the things we believe about in the Bible. This, however, was not the *only* way of putting God into the picture, just one of the several ways. At the same time, following [6], I do believe that there is a link between the *notion* of causal anomaly and the room for God. To illustrate this point, I will propose a competting theory that also relies on this concept. In fact, this theory is in some ways simpler than the one proposed so far, although in light of my time constraints, I will leave the development of this theory (which includes the discussion of "multiple choice making agencies" as well as creation) for further work.

Suppose the creation of the universe is an event a. Then, the event a, together with the deterministic physical laws, determines our actions during the event b. So, *as long as the event a is fixed*, we have no choice when it comes to our actions during the event b. *But*, we still *do* have a choice of *going back* and *changing* an event a, which would subsequently change our actions at b.

Of course, this would *not* be any noticeable change, since our experience shows that we can *not* change the past. So, on "coarse grained" level the event a will "look" the same. But the exact configuration of particles (something we can *not* see) will change slightly. By the "butterfly effect" the unnoticeable change in particle configuration during the event a will produce some huge change at the event b. Thus, on a coarse-grained level it would *appear* that our choice only had an impact on event b and the events *after* b but *not* the events before b; but, on the level of particle configurations, our choice *does* in fact impacts all of the events *before* b.

We can use the same argument in order to allow for God's will. Once a person made a "choice" during the event b (based on the above scheme), God should either reward or punish that choice during some event c that is *after* the event b. But, again, we are faced with the problem: the event c is completely determined by the event a. The answer to this question is the same as the answer to the previous one: God changes the event a *once more* in order to "arrange" for event c to happen. Again, the changes to event a are unnoticeable on "coarse grained" level. But, on the exact level these changes did occur, and they affected both changes in b and changes in c. As far as changes in b occured, they can not be detected on coarse grained level, either. But the changes in c *can be*. Thus, it *appears* that God left both a and b unchanged, and introduced c which looks like a "reward" or "punishment" for b. In reality, He made small changes on a (and, therefore b) that caused large changes in c through butterfly effect.

Now, if one asks how can people be "smart enough" to calculate the changes that needed to be made to the event a (which could have occured billions of years ago), there are at least three competing ways to answer this question:

1) At any given hypersurface we can simply say that a person tells God what his "free will" decision is, and then God, who is "smart", arranges the event a *for* that person to grant him his free will decision. And then, later, God *again* changes the event a in order to produce either a reward or a punishment for the free will decision that He, Himself, "granted" the person earlier. This is consistent with the Christian view of God that it is His desire to *both* allow people a free will (which might mean "generate" their action upon their free will decisions if need be) and *also* reward or punish people for it.

2) If physics laws are deterministic, they will continue to look deterministic under time reversal. Thus, a decision made at some particular time "determines" both the events after *and* the events before that decision. If need be, we can argue that "everyone" makes their decisions at a hypersurface $t = t_0$ which ultimately determines the entire universe before $t = t_0$ and after $t = t_0$. Then, the same thing is being repeated for $t = t_0 + \delta t$, which "rewrites" the history of the universe, and so forth. On the first glance, this seems to contradict what we said earlier about butterfly effect. According to the "classical" notion of entropy on coarse grained level, the changes would magnify both to the future of $t = t_0$ *and* to the past of $t = t_0$; but, we would like the changes to *decrease* to the past of $t = t_0$ in order for them to be unnoticeable on a coarse grained level. We can accomplish this goal as follows: there is a restriction to the "free will" at $t = t_0$: one is not allowed to change their "memory" of the past events. While the *subject* of the memory is the past, the memory, itself, is *current* (for example, it is recorded in the configuration of the particles in the brain). So, a person is constraned to make a *choice* that their "memory" remains unchanged. This choice, through reverse determinism, results in the "past" being "roughly" the same on a coarse grained level in order for it to be "consistent" with the *current* "memory".

Both of these proposals involve backward causality. In the first case, the "choice" at $t = t_0$ starts a causal chain

$$(t = t_0) \to God \to (t = 0) \to (t = \delta t) \to ... \to (t = t_0 - \delta t) \to (t = t_0) \to (t = t_0 + \delta t) \to ...$$

In the second case, a single choice starts two separate causal chains: one to the past, and the other is to the future, neither of which explicitly include God:

$$(t = t_0) \to (t = t_0 - \delta t) \to ... \to (t = \delta t) \to (t = 0)$$

and

$$(t = t_0) \to (t = t_0 + \delta t) \to ... \to (t = t_0 + N\delta t) \to ... \tag{8}$$

In this paper I do not claim to side with either of these views. My goal is to show one or more ways in which freedom of will is *possible*. I do not claim that any of the proposed "possibilities" are actually realized. But, what I *do* claim is that these serve as counter examples against the claim that the freedom of will is *not* possible. Of course, in order for these "possibilities" to work, we have to make sense of circular causality. One way to picture it is a four-dimensional spacetime manifold $x^0 \times x^1 \times x^2 \times x^3$ evolving in the "extra" time dimension x_4 based on the above scheme (thus, we have three space dimensions, x_1, x_2 and x_3, and *two* time dimensions, x_0 and x_4).

The idea of "extra time dimension" is interesting independently of the questions about religion. In particular, as was mentioned by Nikolic in ****, one can use that concept to reconcile quantum nonlocality with general relativity: during the quantum measurement, (x_0, x_1, x_2, x_3)-based four dimensional geometries "collapse" in the fifth dimension x_4. Thus, x_4 replaces x_0 in this respect, which means that one no longer requires the "absolute" x_0 (or any more subtle ways of "sneaking" it in), since the "absolute time" that we are looking for is x_4. This allows us to remain completely loyal to relativity. More detailed discussion about this, of course, is not relevent to the topic of this paper.

Going back to the issue of "circular causality", it is possible to argue that we have "thrown out a baby with a bath water". By introducing extra time dimension, we have replaced the circular causality with a linear one. The "usual" time dimension x_0 is no longer a time dimension; it is really a fourth "space" dimension. It only "looks" like time dimension due to the "dynamics" of the "evolution" in x_4, together with the minus sign in Minkowski metric (which really describes pathological "spacial" geometry). In this view, we have a linear causality, in x_4.

Whether or not we call it "circular causality" boils down to our definition of "event". If by "event" we mean (x_0, x_1, x_2, x_3), then we *do* have a circular causality; if, on the other hand, we mean $(x_0, x_1, x_2, x_3, x_4)$ then we do not. If our motivation is pure science (including Nikolic's approach to interpretation of quantum mechanics), then it is more consistent to view all five dimensions "on the same grounds" since the picture is equally deterministic in *all* of them. Thus, we include x_4 as one of the "coordinates" of an event, and conclude that causality is linear. On the other hand, if we introduce "free will" then, as will be clear from the next section, the extra dimension x_4 will be used for the free will, while the "usual" dimensions (x^0, x^1, x^2, x^3) will be used for determinism. This puts x_4 on "different grounds" and thus provides us with a justification to remove x_4 from the description of an "event", which implise circular causality.

It might also be argued that what we have is really a "double causality" rather than either linear or circular one. In particular, we have a causality in two directions: x_0 and x_4. Again, we might argue that we can go back and forth between "double" causality and linear/circular one, depending on whether or not we include x_4 in our definition of "event". Or, we can view them as competing views and claim that these are different "possibilities" of how the world *might* work. The answer to this question should be based on more detailed exploration of the issues discussed, which is beyond the scope of the current paper. For now, we will leave this up to the views of the reader.

10. Causality and trinity

While our exploration of the questions of causal anomalies certainly has some gaps and some things to work on further, still the point has been made that co-existence of scinece and religion has *something* to do with causal anomalies. We would now like to make a leap and say that the presence of causal anomalies might explain trinity in a non-paradoxical way.

Putting the issue of trinity aside, let us consider a different question. In a four dimensional manifold, a particle looks like a world line, rather than a point. Now, if we take a certain small part of that world line, why do we still consider it to be the "whole" particle, rather than just part of a particle? Let us now consider a different example. Suppose we have an extended object, such as a table. Then, from spacetime point of view, it looks like four-dimensional "cylinder". Now, its leg is only part of that cylinder and, indeed, we *do* consider its leg to be only "part" of the table. At the same time, the trajectory of the table between $t = t_1$ and $t = t_2$ is *also* only part of the cylinder; yet, we think of it as a *whole* table.

What the example with the table illustrates is that the difference between "part" of the table and the "whole" table is in causality. Let the set of points in spacetime (which we denote by S) that are part of a trajectory of a "table" be denoted by T. Now, let the trajectory of one of the legs of the table be $U_1 \subset T$. On the other hand, let the section of T that is described by inequality $t_1 < t < t_2$ be U_2. One notices that any element of $T \setminus U_2$ is causally related to at least one element of U_2. The same is *not* true about U_1. Thus, this might be a key reason why U_2 is viewed as the *whole* table, while U_1 is only viewed as its part.

Now, if the notion of causality is linked to the way we count things, then this implies that "multiple causalities" will mean "multiple" ways of counting thing. Thus, we might have one God according to one of the definitions of causality, and three Gods according to another one. This, of course, is an essence of trinity. From the example with the table it can be seen that in order for there to be "one God", different members of the trinity should be "causally related" to each other. On the other hand, in order for there to be "three Gods" they should be spacelike-separated.

I claim that the members of the trinity are, in fact, spacelike-separated according to *our* time (which is why they occur simulteneously in the bible) but they are separated according to some *other* time. It is quite clear from the previous sections that our time has to be either t, α or τ. As far as God's time is concerned (that is, the "time" with respect to which "three gods" merge into one), it it possible that it is also one of these three parameters. But there is a concern that this would lead to a conflict with the roles these parameters are playing. If that concern proves to be serious enough, we should introduce some other "time" for God (and, hopefully, since we already have three different time-s, the reader is convinced it is possible to introduce a fourth one). Of course, God will still perform creation, miracles, and other things we described within the three times we introduced, but He will have an aditional, fourth, time on top of these.

One way of introducing extra causality separate from the ones discussed previously is by linking the notion of causality with the transmission of information. If different members of trinity are in posession of all the information about other members of trinity, then this implies a separate causality. Again, I am not entirely sure about this either. After all, the actual information is part of "dynamics" rather than "kinematics"; thus, the different members of the trinity are still "spacelike separated" but the "dynamics" assures that different "spacelike separated" events have all the information about each other. On the other hand, it can be argued that we "learn" about kinematics (especially the "causal structure") by means of dynamics, which would justify us caling it "extra causality".

Yet another way of introducing extra causality is by appealing to the concept of causal loops as opposed to double causality. If we have two events, a and b, that simulteneously satisfy $a \prec b$ and $b \prec a$, then we can say that, in one sense, they are "spacelike separated", while in another sense they are "causally related". Thus, two different notions of causality. We can then follow [6] and claim that precence of causal loops distinguishes God from everything else; this would logically imply the existence of extra causality, specific for God.

Finally, we can also introduce extra time by recalling that, throughout the paper, we defined time in terms of consciousness. That is, we said that, as the *real* time τ progresses, the "consciousness" travels along the t direction, which imposes the timelike nature on the "space" direction t. Now, if the consciousness "decides" to travel along the true "spacelike" directions, such as x_1, x_2 or x_3. , these, too, will become "timelike" (despite the fact that, due to the metric signature, they will continue to be "spacelike" as far as physics is concerned). Or, we can instead introduce some new coordinates altogether, such as x_5, x_6, etc. and make them "timelike" by the above method.

The general framework of our proposal of introducing several causalities is as follows. We have two "conscious" agencies. During some specified *real* time τ, the "first" conscious agency is "looking" at the events a and b (among many other events that we are not specifying). The second conscious agency, however, is looking at the event a and *not* an event b. Then, at a time $\tau + \delta\tau$, the "first" conscious agency will no longer be looking at either the event a or the event b, while the second conscious agency will *stop* looking at a and *start* looking at b. Thus, according to the first conscousness events a and b are spacelike separated while according to the second one they are causally related.

This, in fact, is exactly what happens with ordinary spacial relativity, if we insist on replacing the usual lightcone causality with a stronger one based on a specific reference frame, as, for example, is often done for the purposes of interpretation of quantum mechanics. This multiple causality leads to a famous paradox that, if we combine these two causalities, we might "kill our infant grandfather". In our case, we propose similar phenomena, except that we replace Lorentz transformations with coordinate permutations. Thus, any given coordinate can be spacelike in one "frame" and timelike in another.

Again, these are all open questions that I will leave for further research. As far as this paper is concerned, we will simiply leave open the following possibilities:

1) Use either τ, t or α for God's causality, making sure that the parameter we pick for God is separate from the one we pick for humans

2) Use the notion of "transmission of information" to introduce a fourth time parameter for God

3) Use circular causality as a means of introducing extra time parameter

4) Use the observation

4) Introduce extra time parameter by some other means

5) Combination of the above

Now, there are two separate "paradoxes" linked to Jesus. One of them is trinity (that is, how can God be both one and three at the same time). The other one is how can Jesus be both man and God at the same time. This, second, paradox can *also* be accounted for by causality. It was shown by Malement ([3]) and Hawking ([2]) that there is a one to one relation between the causal structure of spacetime and the metric, up to Weyl scaling. That is, if we know that we live in continuum manifold, then $\prec$ uniquely determines $g_{\mu\nu}/|g|$. Apart from determining metric, causal relation determines topology, as well. Therefore, if we have two different causal relations then it is possible that Jesus is limitted in space according to one of them, and He fills the whole space according to another one. This makes Him both man and God.

Now that we have shown a qualitative picture on how the causality can explain trinity, let us now to give more quantitative definition of the link between causality and counting. From now on we will assume only one time direction, and we will be focused on the "secular" question regarding the "table". The specific way of applying it to God depends on the way we choose between the above options, which is up to future research. However, we *will* allow for the "single" causality that we have to be circular. The main reason is to keep open the option number 3, which might not require us to introduce a separate causality specific for God. Thus, we define the causality as simply a transitive relation, as follows:

Definition Let S be a set. The relation $\prec$ on S is said to be *transitive* if whenever a, b, and c are three elements of S satisfying $a \prec b$ and $b \prec c$,. then the condition $a \prec c$ holds.

At the same time, we will *also* define a usual notion of *linear* causality. We will eventually propose some ways of "extracting" various linear causalities from the original, circular, ones. It is easy to see that our notion of linear causality coincides with the well known definition of partial order. Thus, we will define the former by simply reiterating the definition of the latter:

Definition Let S be a set. The relation $\prec$ is said to be *partial order* on S if $\prec$ is transitive, and one can not find an element $a \in S$ satisfying $a \prec a$

In order for us to make a "table" picture quantitative, instead of saying that a leg of a table is not a whole table, we should instead be able to give a ratio. This requires us to draw a spacelike section to the relevent cylinder, and measure the area of this section. In order to make this precise, we will assume that our spacetime is discrete; thus, we can measure things by simple count of points. The continuum case can be worked through by measure theory. This might be quite sophisticated since the measure will have to be applied to hypersurfaces rather than the four dimensional regions, and it is beyond the scope of this work.

Now, in discrete case, we intersect the leg of a table with discretized spacelike hypersurface, and count the number of points in order to measure the area. In other words, we count the number of points that are *not* causally related to each other. In case of linear causality (or, equivalently, a partial order) we are assured that the number of these points is greater or equal to one: every point is causally unrelated to itself. In case of the presence of causal loops, however, this is not necessarely true. For example, if all points are causally related to all other points *as well as* themselves, then the number of causally unrelated points will be 0. Thus, in order to find a ratio we will have to divide one such number by another one, which might lead to division by 0.

We adress this issue by replacing the word "causally unrelated" with the word "spacelike separated", where, by definition, every point is "spacelike separated" from itself. Thus, we introduce the following definition:

Definition Let S be a set, let $\prec$ be a transitive relation on S, and let a and b be two elements of S. We say that a and b are *spacelike separated*, and write $a\tilde{}b$ if and only if *at least one* of the following two conditions are met:

a) Neither $a \prec b$ nor $b \prec a$ holds

b) $a = b$

Despite the notation, it is important to note that the above is *not* an equivalence relation. For example, in case of $1+1$ Minkowski space, $(0,0)\tilde{}(1/2,1)$ and $(1/2,1)\tilde{}(1,0)$ both hold; but $(0,0)\tilde{}(1,0)$ does *not* hold.

Our definition of "timelike separated" however, is the one we are used to:

Definition Let S be a set, let $\prec$ be a transitive relation on S, and let a and b be two elements of S. We say that a and b are *timelike separated*, or, equivalently, *causally related* if either $a \prec b$ or $b \prec a$.

In terms of the two definitions we have just introduced, the presence of the circular causality is equivalent to the fact that two points can be both spacelike separated *and* timelike separated from each other. However, in the latter case, these elements are equal to each other. We will sum it up in two theorems:

Theorem Let S be a set and let $\prec$ be transitive relation on S. If p and q are both spacelike separated and timelike separated, then $p = q$.

Proof Since p and q are timelike separated, we must have either $p \prec q$ or $q \prec p$. Thus, the condition "a" of the definition of "spacelike separated" is not met. Thankfully, in order for them to be "spacelike separated" we need only *one* of the two conditions to be met (not necesserely both). Thus, since p and q are spacelike separated, and condition "a" is not met, we conclude that the condition "b" is met; in other words, $p = q$.

Theorem Let S be a set, and let $\prec$ be a transitive relation on S. Then $\prec$ is partial order if and only if one can *not* find two elements that are both spacelike separated and timelike separated

Proof Suppose we found a and b that are both spacelike separated and timelike separated. Then, by previous theorem, $a = b$. The fact that they are timelike separated means that either $a \prec b$ or $b \prec a$. By substitutting $b = a$ we abtain $a \prec a$, which means that $\prec$ is *not* a partial order. Now suppose that we can *not* find a and b that are both spacelike separated and timelike separated. By definition, we know that any element p is spacelike separated from itself. Thus, p is *not* timelike separated from itself. In other words, we can *not* have

$p \prec p$. This, together with the fact that $\prec$ is transitive, by definition, implies that $\prec$ is a partial order.

As was discussed earlier, our goal is to use double causality in order to explain trinity. Furthermore, we have mentioned that if we stick with option number "3", then we can use the circular causality in order to "extract" the extra causality by removing causal loops. Let us now define more rigurously the way to do that. For any circular causality $\prec$, we will define corresponding linear causality by $\prec^p$. We will first define $\prec^p$ as, itself, a "circular causality" (or, equivalently, "transitive relation") and then we will prove that this *specific* circular causality *happens* to be a linear one (or, equivalently, a "partial order"):

Definition Let S be a set and let $\prec$ be a transitive relation on S. Then $\prec^p$ is another relation on S defined as follows: $a \prec^p b$ if and only if $a \prec b$ holds and $b \prec a$ does *not* hold.

Theorem Let S be a set and let $\prec$ be transitive relation on S. Then $\prec^p$ is a partial order on S.

Proof First lets show that $\prec^p$ is transitive. Suppose $a \prec^p b$ and $b \prec^p c$. By definition, these statements, respectively, imply that $a \prec b$ and $b \prec c$. Since $\prec$ is transitive, this implies that $a \prec c$. Now suppose we also had $c \prec a$. Then, together with $a \prec b$ we would have obtained $c \prec b$, which, by definition, contradicts the statement $b \prec^p c$. Thus, by contradiction, we see that $c \prec a$ does *not* hold. This, together with $a \prec c$ implies that $a \prec^p c$, which proves transitivity of $\prec^p$. Now, suppose there was an element a satisfying $a \prec^p a$. By substitutting $b = a$ into a definition of $a \prec^p b$, we obtain two statements: one is that $a \prec a$ holds, and the other is that $a \prec a$ does *not* hold. This is a contradiction. So, by contradiction we know that there is no element a satisfying $a \prec^p a$. This, together with the transitivity of $\prec^p$ implies that $\prec^p$ is a partial ordering on S.

We are now ready to talk more directly about the problem of a "table". As was mentioned earlier, we think of a spacetime trajectory of a table as a set $T \subset S$, where S is our spacetime. We would now like to intersect T with a spacelike hypersurface. We will adapt the language of causal set theory, and call such intersecton an "antichain" of T. Furthermore, we will call the set of all possible such intersections as "antichain set of T". We will define it as follows:

Definition: Let S be a set and let $\prec$ be a transitive relation on S. Furthermore, let $T \subset S$ be a subset of S, and let $\mathcal{P}(T)$ be a power set of T. The *antichain set* of T, $A(T, \prec) \subset \mathcal{P}(T)$ is a set of subsets of T defined as follows: $U \subset T$ is an element of $A(T, \prec)$ if and only if the following conditions are met:

a) Any two elements of U are spacelike separated from each other

b) Any element of $T \setminus U$ is timelike separated from at least one element of U

While the "antichains" of T intersect T "completely", it is also possible to intersect T "partly"; the sets U that do the latter are referred to as "snapshots" of T. Intuitively, if we want to make a photograph of a small object, that photograph will be an "antichain"; but if that object is too large to be captured completely, the photograph will instead be a "snapshot". Now, the antichain is a special case of a "snapshot"; thus, the photograph is "snapshot" in all cases, which is the motivation of the term. More precisely, the "snapshot" is defined as follows:

Definition Let S, T and U be sets satisfying $U \subset T \subset S$, and let $\prec$ be partial order on S. The set U is said to be a *snapshot* of T if it is non-empty, and any two elements of U are spacelike separated. The set of all snapshots of T is denoted by $B(T, \prec)$.

For our purposes, it is important to know that the number of snapshots is non-zero, which can be easilly proven:

Theorem Let S be a set and $\prec$ a transitive relation on S. Then any non-empty $T \subset S$ has at least one snapshot.

Proof If T is non-empty, we can select at least one element $p \in T$. The fact that $p = p$ implies that $p\tilde{p}$. Thus, the set $\{p\}$ meets the criteria of a snapshot of T.

In order to be able to measure the "ratio" of the leg of the table to the table itself, we would like to "extend" the antichain with respect to the leg to an antichain with respect to the table, and take the ratio of their numbers of elements. Now, it is easy to see that an antichain with respect to the leg is a snapshot with respect to a table. Thus, in terms of a table, we would like to "extend" a snapshot to fill an antichain. Let us prove a theorem that this, in fact, is possible:

Theorem Let S be a causal set, and $\prec$ be a transitive relation on S. Let $T \subset S$ be finite subset of S, and let $U \subset T$ be a snapshot of T. Then U is a subset (and, therefore, a snapshot) of at least one $V \in A(T)$.

Proof I claim that if there are no *proper* subsets of T that meet the above criteria for V, then the set T, itself, meets that criteria. Assume the former. Let the induction hypothesis regarding the integer k, $S(k)$, be the following: *either* $k > \sharp T$ *or* there exist a snapshot of T, with k elements, that contains U as a subset. That hypothesis $S(k)$ is true for $k = \sharp U$: we can use U as an example of a set with $\sharp U$ elements that contains U as a subset. Now suppose $S(k)$ is true for some other k. If $k \geq \sharp T$, then $k+1 > \sharp T$, which means that $S(k+1)$ is true. Thus, we are left with the case of $k < \sharp T$. The fact that $S(k)$ is true means that there exist a set W_k with k elements, which is snapshot of T and which contains U as a subset. Now, since W_k is a snapshot of T, we know that it is subset of T. Furthermore, since $k < \sharp T$, we know that W_k is a *proper* subset of T. Thus, by assumption, W_k is *not* an element of $A(T)$. But, at the same time, the fact that W_k is a snapshot of T implies that all of its elements are spacelike separated from each other. Thus, the only thing that would disqualify W_k from being an element of $A(T)$ is that there exist at least one element of $p \in T \setminus W_k$ that is *not* timelike separated from any of the elements of W_k. This means that p is spacelike separated from all of the elements of W_k. Since W_k is a snapshot of T, any two elements of W_k are spacelike separated from each other. Thus, from what we just learned about p, we conclude that any two elements of $W_k \cap \{p\}$ are spacelike separated from each other. Furthermore, the fact that W_k is a snapshot of T implies that $W_k \subset T$. Also, the fact that $p \in T \setminus W_k$ implies that $p \in T$. Together, this implise that $W_k \cup \{p\} \subset T$. Since we have already estabished that elements of $W_k \cup \{p\}$ are spacelike separated from each other, we conclude that $W_k \cup \{p\}$ is a snapshot of T. Now, the fact that $p \in T \setminus W_k$

implies that $W_k \cup \{p\}$ has $k+1$ elements. Thus, $S(k+1)$ holds. Thus, we have proven by induction that $S(k)$ holds for all $k \geq \sharp U$. In particular, $S(\sharp T)$ is true. Thus, there is a snapshot of T with $\sharp T$ elements that contain U as a subset. Now, a snapshot of T has to be the subset of T, and the only subset of T with $\sharp T$ elements is T itself. So T has to be its own snapshot. In other words, all elements of T are spacelike separated from each other. Thus, T meets criteria "a" of an element of $A(T, \prec)$. Now, since $T \setminus T = \emptyset$, any statement about the elements of $T \setminus T$ is automatically true. Thus, T meets the criteria "b" for $A(T)$ as well. In other words, $T \in A(T)$, and, by assumption, $U \subset T$. Now, the key assumption in our induction step was that the statement of the theorem is *not* satisfied by any proper subset of T. Thus, the conclusion of our argument is that *this assumption* implies that it *is* satisfied by $V = T$. This means that in general it has to be satisfied by *some* subset of T (either proper or otherwise), which is what we were trying to prove.

Now that we have proven that we can "extend" a snapshot to "fill up" an antichain, we can take a "snapshot" that fills up a leg of a table, extend it to fill an antichain, and take the ratio of the number of points. However, in light of relativity, there is more than one way of extending a snapshot into the antichain, and different ways will give us different rations. In order to see which of these ways we prefer, lets consider the following example. Suppose we live in 1+1 dimensions. Then both the snapshot and antichain is 1-dimensional, and we will use lightlike lines to extend the former into the latter. In this case, the ratio is 1. This is *not* what we want since we have established previously that, in light of spacelike separation, the leg is only a part of the table.

From this we make a guess that instead of taking the "shortest" extension, we should take the "longest" one. In light of Lorentzian signature, the "longest" antichain is a straight line that crosses a table, which is perpendicular (in Lorentzian sence) to the timelike direction of "motion" of a table.. Our original snapshot, however, is fixed, which means we do not have a freedom to maximize its length. Thus, the original snapshot is a curve that intersects a leg of a table. That curve is then continued by a straight line that crosses the rest of a table.

Now, if the "curve" happened to be a straight line, and it happened to also be perpendicular to the direction of motion of a table, then the ratio of lengths will be the one we expect. If curve is anything else, the ratio will be smaller, but that is okay since we do not have any strong beliefs regarding that case. If the "snapshot" that fills up a leg of a table is *also* perpendicular to the direction of motion of the table, it is easy to see that the ratio will be what we want. In case of "diagonal" snapshots, the ratio will be smaller than we want.

This, however, does not contradict our beliefs: if we allow the particles to be created and annihilated, we can argue that, due to the difference in volume, the immediate vicinity of a curve contains smaller number of particles than the immediate vicinity of straight line. Thus, the only thing we *trully* insist on, is that if a snapshot is a straight line, perpendicular to the velocity of the table, then the ratio should be the one we expect, which is true. Thus, we propose the following definition:

Definition Let S be a set with a transitive relation $\prec$ and let T be its finite subset. Let

$U \subset T$ be a snapshot of T. Then

$$F_1(U,T,\prec) = \frac{\sharp U}{max\{\sharp V | V \in A(T,\prec) \wedge U \subset V\}} \tag{9}$$

We are not completely done yet. After all, from spacetime point of view, the "leg" of a table is four dimensional object; what we were looking at so far was three dimensional one. Since our definition of ratios involve only kinematics, we should not make any "dynamical" assertions, including the rigidity of the table or its leg. Thus, it is possible that, with time, both the leg and the table changes their volumes, and they do that in such a way that their ratio changes, too. This means that, again, we are faced with the question: should we take the maximum of that ratio, or the minimum?

Again, in order to answer this question, we take an extreme case. Suppose we, again, consider the example of a snapshot we just discussed, but this time we view that snapshot as a special case of a four dimensional object, whose thickness in time dimension is 0. In this case, at a time $t = t_0$, its volume is non-zero, but at all other times it is zero. Therefore, the "minimum" of the ratio will be 0, while the "maximum" will be the desired ratio. Thus, guided by this example, we use maximum to define the four dimensional ratio:

Definitin let S be a causal set and let T and U be its subsets, satisfying $U \subset T \subset S$. Then

$$F_2(U,T,\prec) = max\{F_1(V,T,\prec) | V \in B(T,\prec) \wedge V \subset U\} \tag{10}$$

Finally, we explicitly prove that both three dimensional, and four dimensional, ratios of a leg to the table is, in fact, what we want:

Theorem Let S be a set with transitive relation $\prec$ and let T be one of the snapshots of S. Then, for any $U \subset T$,

$$F_2(U,T,\prec) = F_1(U,T,\prec) = \frac{\sharp U}{\sharp T} \tag{11}$$

Proof By definition,

$$F_1(U,T,\prec) = \frac{\sharp U}{max\{\sharp V | V \in A(T,\prec) \wedge U \in V\}} \tag{12}$$

Since in the denominator we are only considering $V \in A(T,\prec)$, and one of the necessary requirenments for the latter is $V \subset T$, it is clear that $\sharp V \leq \sharp T$. Thus, the "maximum" of $\sharp V$ satisfies the same inequality. In other words, denominator is less than or equal to $\sharp T$. However, $V = T$ satisfies the condition of the denominator. This means that denominator is exactly equal to $\sharp T$. Thus, the ratio is

$$F_1(U,T,\prec) = \frac{\sharp U}{\sharp T} \tag{13}$$

Now, by definition,

$$F_2(U,T,\prec) = max\{F_1(V,T,\prec) | V \in B(T,\prec) \wedge V \subset U\} \tag{14}$$

But, from the fact that U is a snapshot of T, we know that any $V \subset U$ is also a snapshot of T. Therefore, from what we have just found,

$$F_1(V, T, \prec) = \frac{\sharp V}{\sharp T} \tag{15}$$

Thus,

$$F_2(U, T, \prec) = max\{\sharp V / \sharp T | V \in B(T, \prec) \wedge V \subset U\} \tag{16}$$

Now, we notice that $V = U$ satisfies both of the conditions we impose on V, and also it has more elements than any other $V \subset U$. Thus, we obtain

$$F_2(U, T, \prec) = \frac{\sharp U}{\sharp T} \tag{17}$$

which completes the proof. QED.

Let us now return to the question about trinity. Let T be God; let U_1 be "God the Father", U_2 be "God the Son", and U_3 be "God the Holy Spirit". The statement that there is "one Gods" is equivalent to $F_2(U_1, T, \prec) = F_2(U_2, T, \prec) = F_2(U_3, T, \prec) = 1$ On the other hand, the statement that there are "three gods" is equivalent to $F_2(U_1, T, \prec) + F_2(U_2, T, \prec) + F_2(U_3, T, \prec) = 1$. If we have one causal relation $\prec$, they clearly contradict each other. But, if we have two causal relations, $\prec_1$ and $\prec_2$, then one of the equations can be true for the former and the other one for the latter:

$$F_2(U_1, T, \prec_1) = F_2(U_2, T, \prec_1) = F_2(U_3, T, \prec_1) = 1$$

$$F_2(U_1, T, \prec_2) + F_2(U_2, T, \prec_2) + F_2(U_3, T, \prec_2) = 1 \tag{18}$$

which can explain why we have one God and three gods at the same time. It is easy to see that, according to $\prec_1$, the members of the trinity should be causally related to each other, while according to $\prec_2$ they are not. Now, in *our* time, all members of the trinity co-exist any given day. This means that the time we live in is defined based on $\prec_2$, while the time in which there is only one God is defined based on $\prec_1$.

Now, apart from trinity there is a separate paradox: how can Jesus be both God and man? This question is actually quite deep and I don't claim to complately adress it in this paper. But, as far as this paper is concerned, I will limit it to the question as to how can Jesus be God without being omnipresent. In other words, how can He be limitted in physical space? In order to claim that Jesus is omnepresent, we have to say that $F(U_2, A, \prec) = 1$, where F is either F_1 or F_2, and $\prec$ is *one* of the available causalities. The freedoms we have just mentioned give room to at least two ways for Jesus to be omnipotent and limitted in space at the same time:

a) In light of the fact that we have more than one causal structure, it is possible that $F_1(V, A, \prec_1) = 1$ but, at the same time, $F_1(V, A, \prec_2) < 1$, where V is a some snapshot of U according to $\prec_2$. Now, a special case of a snapshot is an antichain. From what we said earlier, $\prec_2$ is a causality in which humans operate. Thus, an antichain of U according to $\prec_2$ is simply Jesus that people have seen at a particular specified time. This can be expressed as $V = U \cap P_t(S_\alpha) \cap F_t(S_\alpha)$. The fact that $F_1(V, A, \prec_2) < 1$ means that this Jesus was, indeed, limitted in space according to $\prec_2$; but, as far as $\prec_1$ is concerned, that same set V is "omnipresent" (due to $F_1(V, A, \prec_1) = 1$). This can be better understood based on the observation made by Malement and Hawking (see ****) according to which the causal structure $\prec$ determines both topology and geometry (up to Veyl scaling $|g|$). Thus, two different causal structures implies co-existence of two different topologies. It is conceivable that Jesus fills the whole space according to one topology but not the other.

b) We recall that F_2 is defined as a *maximum* of F_1. Thus, if $F_1(U_2 \cap P_{t_1}(S_\alpha) \cap F_{t_1}(S_\alpha), A, \prec) = 1$, it *guarantees* that $F_2(U_2, A, \prec) = 1$, *even if*, for some other $t_2 \neq t_1$, $F_1(U_2 \cap P_{t_1}(S_\alpha) \cap F_{t_1}(S_\alpha), A, \prec) < 1$. Now, t_2 is a time during which Jesus was alive, while t_1 is some other time in history. Thus, as a result of Jesus being omnepresent at a time t_2, he is omnipresent by definition, even though he was not omnipresent at a time t_1. This can be understood from the example of a chair. We agreed that $t = t_0$ section of a chair is, in fact, the *whole* chair, even though this section has size 0 at times $t \neq t_0$. This means that, even if Jesus' size were to reduce to 0 at some time, he would *still* be omnipresent since He has been that way at other times. Now, since his size is *larger* than 0, he is even more so omnipresent.

11. Conclusion

In this paper I have shown followed the idea of Minguzzi in [6] that one can use causal anomalies in order to introduce God into physics. In particular, I have shown how it is possible to account for freedom of will, seven day creation, as well as trinity, by incorporating causal anomalies into the theory. In essense, I have shown that due to causal anomalies the Earth is "both old and young", freedom of will "both exists and does not exist", and the number of Gods is "both three and one". Each of these "contradictions" is accounted for by two sets of competing causalities, each giving a different answer to the above questions.

This work, however, is by no means complete. I believe that there is definitely more than one way of using causal anomalies to obtain the above results, and it is crucial to try to use the constructions other than the ones I have been using here in this paper and explore their similarities and differences. One example of a "competing" construction was proposed in Chapter 9. It might be worth while to explore its implications on the questions that were raised in the other chapters. Apart from that, in Chapter 10, it was stated that, while I know that trinity might have something to do with multiple causalities, I am not sure as to *which* causalities to use. Thus, for the future work, it is worth trying to use some specific causalities for trinity and spell out more explicit mechanism for trinity to arize, based on these causalities.

One of the other shortcommings of this work is that I didn't introduce God, or "choice making agencies" as mathematical constructs. This shortcomming might be quite serious in light of the fact that in [6] such definition of "God" *was* in fact proposed, which raises a question as to why didn't I use it? The reason that I haven't is, basically, in this work I was attempting to assign God some "active" roles in creation as well as being one of the "choice making agencies" later on. In [6], on the other hand, God was described as a "passive" subset of a causal set. While it is true that causal structure implies active roles, the attempt at "dynamics" was not made, which is why it was easier to be more mathematically precise at "kinematics".

However, for the future, it is crucial to bring a dynamics to the same level of riguour as kinematics. Thus, it is crucial to exactly define God, and then define mathematical mechanism by which the "choices" are being made by Him. Similarly, it is crucial to do the same thing for the human souls (which I referred to as "choice making agencies" in this paper).

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