

Quantum Origins of the question of God.

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Abstract: By taking a closer look at true quantum theory stemming from the idea of Hyperspace and it's effects on lightcones versus our observational state I show the question of is there a God cannot honestly be eliminated from what is possible. I also in brief discuss the possibility of the human soul or spirit from the aspect of Observation and Quantum Theory in the first place.

Suppose we have a black hole space-time described in general relativity by some set of

α
coordinates $\{x^\alpha\}$ and some metric tensor g_{ab} . The paths of light rays are described by null (i.e. lightlike) geodesics, which are computed using the geodesic equation

$$\xi^a D_a \xi^b = 0, \quad \xi^a \xi_a = 0$$

where D_α is the covariant derivative for the metric $g_{\alpha\beta}$ and

$$\xi^a = \frac{dx^a}{d\tau}$$

is the tangent vector to the null geodesic in question, and t is the distance parameter along the geodesic, the analog of time along a ray of light.

The possible transverse (orthogonal to the propagation direction) deformations of a bundle of null geodesics can be reduced to three types: the expansion q , rotation w_{ab} and shear s_{ab} , computed as the trace, antisymmetric part and symmetric part, respectively, of the covariant derivative of the geodesic tangent vector

$$\theta = \text{Tr } D_a \xi_b, \quad \omega_{ab} = D_{[a} \xi_{b]}, \quad \sigma_{ab} = D_{(a} \xi_{b)}$$

Taking the derivative of the expansion q along a null geodesic leads to what is called the **focusing equation**

$$\xi^a D_a \theta = \frac{d\theta}{d\tau} = -\frac{1}{2} \theta^2 - \sigma_{ab} \sigma^{ab} + \omega_{ab} \omega^{ab} - R_{ab} \xi^a \xi^b$$

If we're in a space-time with no rotation, and the matter and energy density is positive, then we arrive at a very important inequality for q that is the key to all the mysterious and interesting properties of black holes:

$$\frac{d\theta}{d\tau} + \frac{1}{2} \theta^2 \leq 0 \rightarrow \frac{1}{\theta} \geq \frac{1}{\theta_0} + \frac{1}{2} \tau$$

The quantity q measures how light rays expand or converge, in other words q measures the focusing of light by gravity. According to our sign convention, if q is negative, it means the light rays are being focused together instead of spread apart by the space-time geometry. The above inequality tells us that once light rays start being converged by gravity with some value $q_0 < 0$, then in a finite distance along the light ray, nearby light rays will be focused to a point, such that they cross each other with zero transverse area A

$$\theta \sim \frac{1}{A} \frac{dA}{d\tau}, \quad \theta \rightarrow -\infty \Rightarrow A \rightarrow 0$$

This is bad news if these light rays all emanated from a single source, because it means the light is being infinitely focused into a singularity, and the concept of a geodesic has broken down. When q turns negative for both "incoming" and "outgoing" light rays, it means that the light has been **trapped**, that the escape velocity from that gravitational field has become greater than the speed of light.

The problem with the type of focusing of light that defines the presence of a black hole is that once it starts, the focusing equation says that it ends in utter disaster. Once a bundle of null geodesics becomes trapped by crossing to $q < 0$, within a finite distance along each geodesic, $q > -\infty$, the geodesics will cross at a point, and the transverse area of the bundle will go to zero. When this happens, the necessary conditions for the existence and

uniqueness of these geodesics are violated, and it's no longer possible to use the geodesic equations to predict what happens to the geodesics after they cross.

The space-time will then exhibit one of the two possible behaviors:

1. The space-time curvature in this region remains finite for all observers, but notion of predictability for the space-time breaks down, and evolution of the space-time can no longer be uniquely predicted from a set of initial data.
2. The space-time curvature in this region becomes infinite for all or some observers, so that there simply is no possibility of extending geodesics past the point where they cross, they simply end there. The space-time as a whole retains its predictability but the region contains a space-time singularity where the paths of observers simply end their existence, and space-time itself can no longer be defined.

The "standard form" of Penrose's conjecture holds for an asymptotically flat Riemannian 3-manifold on which the constraints of General Relativity hold, and which contains a trapped surface (a "black hole"). It reads that the total energy (the "ADM-mass") is bounded from below by the square root of (16 pi times) the area A of the outermost trapped surface (the apparent horizon). This result was conjectured by Roger Penrose who also pointed out that his inequality supports the so-called "cosmic censorship conjecture".

What we find from the hyperspace concept is that:

1. The space-time curvature in this region remains finite for all observers, but notion of predictability for the space-time breaks down, and evolution of the space-time can no longer be uniquely predicted from a set of initial data.
2. The second case does not hold. What we from the outside view as an infinite curvature and the end of space-time is nothing more than the expansion of the lightcone towards infinity stopping short at a value equal to the escape velocity of the BH state of C^3 . Given the huge and finite size of the cosmos and the even larger internal velocity of light or information transfer the local frame is the sum of the entire history of events for the cosmos. Its this sum of total history, since part of that history has yet to occur in our limited lightcone state that limits our predictability of the trapped internal state. But the internal state once examined this way remains a product of predictability. There is no actual breakdown of predictability of any system in nature.

This has huge implications when it comes to initial value data and implies a sort of answer to Einstein's old question: Does God play dice? The answer is God does play dice, but he does so with a loaded set of dice predetermined to have the outcome we observe in our limited observational position. But how much predictability is there in this system. To answer that question we must assume that since the internal history is that which unfolds external in our frame that observers do exist in the form of ourselves in that internal state. History would only be incomplete without us in the equation to begin with. So, going back to normal quantum theory given that it is known that observation in itself effects

the outcome of any event then the original events, even though completed and actually having full predictability in our space-time must have involved a certain amount of chance due to the effects of the original act of observation. That being the case then these loaded set of dice that God plays with only became preloaded during the original act of observation.

This implies what those who work with Chaos Theory have said all along about predictability of large systems. It also speaks to our ability to fully know everything. Sure we can given time discover a set of equations that in general explain all the forces of nature as a unified set. But there will always be events and aspects of the play out of history and predetermined events that defy our ability to determine full predictability. We cannot know everything nor can we ever expect to account for everything. Part of the system of information when we study nature is simply at present outside the scope of our limited observational field.

The same applies to the start of the Cosmos itself. Sure we can go backwards via what we do know and can observe. But there is a point at which our understanding of time itself breaks down when we encounter the first primary event horizon itself. There is information trapped inside that event horizon and only the full working out of history will ever display to us.

We simply cannot determine in a fully evolved predictability system if there were observers of any type even prior to us or if the whole act of creation could have been the result of an observer's act of observation on an unknown original state. Sure science can look at the data we have and predict that if there was such an observer we do not have any direct evidence about the original observer. But the fact that we are here to observe in the present and the fact the system as a whole requires we were there to observe in the original tends to beg the question are we the result of that original observers act of observation? Neither of these two situations can be fully eliminated from the possible. We could even carry that same logic path to an even more weird case of what is possible and ask the question could we have been those original observers? The only sort of answer we could provide is it is possible even if that rather implies some original truth to the idea that we have an immortal spirit or soul.

I can look at the limited data we have and say if anything the system seems predetermined for natural cause and event processes we call evolution to occur. But even those Cause and Event predictability outcomes have an origin in a chain of cause and events I cannot fully ever expect to know. That in itself has implications when it comes to the origin of life itself. What I could be asking is if we wanted to create a baby universe with life in it would we want everything to be predictable or would we want to create a system with an element of chance involved and sit back and watch as events unfold? Human nature tends towards a combination of both which is closer to what we actually find in nature when we do study aspects about the evolution of life. Most religions in one form or another see us as imprinted with what some call the image of God. Perhaps that image is reflected in our own nature and God in setting up his loaded dice game decided to use both aspects also.

That in itself does not back up any one religion versus another. Its by far different from the traditional Christian Fundamentalists idea of a God who predetermined everything from the start, acted upon every event of history and molded everything the way he wanted it molded. So, if there is a God, so to speak, I see no firm foundation for the traditional Fundamentalists idea of God out of what we can know from science even if I cannot fully as an honest scientists eliminate the possibility of such a Being. If anything I would tend more towards such a Being sharing aspects of our own nature given what I can know.

Words like Curious, Creative, seeking knowledge, etc come more to my mind out of all I can know. I am not so sure Loving fits into the situation due to a noted lack of care about ever actual event. But it also must be noted we cannot eliminate the act of observation at key events either which would allow for such to be the case then. We do know from the outplay of history here that we have been the present and observed Observers at certain events which given what is possible could imply we have guided our own path all along. That in itself would imply words like Care and Loving.

The traditional story about God from the Old Testament is God created everything to glorify himself and that man was created to fellowship and love God, that he was created with Free Will, that behind these events was the solution of God for the problem of rebellion by some of His original created Beings called angels also capable of free will. Seems more like us being created to become a replacement for an original creation that by free will decided in part not to fellowship with their Creator. And mixed into this us becoming by our own act of rebellion which to some Christian belief was predetermined we provide the solution to that original act of free will rebellion. We then become the tool for God to step in and put an end to that rebellion once and for all. Begs the question why does God need any outside agency in the first place to end a rebellion? If God is God then God can by rights do with his creation what ever God wants to do with his creation. It also begs the question of the sanity of at least those of his creation who decided to rebel against God knowing they were fighting a no win battle. One could also ask why did not God simply wipe out that old creation and why put free will back into the equation knowing full well that ability would lead to rebellion again.

Makes God out to be the double blind kind of experiment sort of Being where the specific known bad drug is administered over and over again. I suggest if the drug is bad it will always yield a bad outcome. Sure the Christian can respond God had a purpose behind all of this. But what type of Loving God gives out a bad drug, knowing it will lead to a fall simply because that is what He desires in the first place? Yes, you can point out God is Just and does not want to simply judge without proving his case in the first place. But what type of justice is there in proving a case with a situation He predetermined the outcome of and allowed bad events to transpire simply to prove His case? Sure one can point to what I said about God being God in the above paragraph. But it does call into question the whole idea of justice and love. To me it rather paints God more like us than us like God. Seems we do tend to create God in our own image instead of the other way around.

If one wants to follow the Creator path a bit we could ask How would a Creator who created a certain natural process go about making his Creation? One aspect falls right out of the whole multiverse idea to begin with. It takes a certain kind of vacuum state with certain physical properties for matter as we know it to exist. One aspect of the multiverse approach has been that our vacuum state tends to be the resultant of the admixture of all the other possible vacuum state into one whole system whose total wave function sums out to our state. Thus, even though one would think a Creator would want to limit chance we actually find by expanding chance or random states one ends up with a summation wave function with the properties of the vacuum we find ourselves in. So one would be led to the finding that order was created via a blending and expansion of Chaos.

We would then have to determine or make an assumption that life was intended to fill that resultant universe. Again the simplest way to produce the highest chance for life in such a universe would be not to focus on one chain of events. The perfect path again follows the first in an increase of chaos so that the combined resultant results in a chain of events dictated by all the combined wave functions whose end is life itself. Sure we could say that life was the plan all along. But the path to life involves an indirect

focus point that is the result of multiple possibilities. We Scientists call that path Evolution. On the surface the system seems like random chance producing a best seller. But when you look under the surface what seems like pure chance becomes a system that has only one actual conclusion or outcome.

What type of Creator do we have now? A Creator who uses natural processes to his own desired goals. A Creator who uses Chaos to produce order not by doing away with that Chaos, but, rather, by focusing that Chaos into the order he desires. In all of this I have neither denied the idea of a Creator, nor have I violated any natural law along the way by invoking a Miracle Event. I have let Natural Law stay natural and achieved the same conclusion Science gathers from the facts it has ability to study even though the discussion included the idea of God. What I have avoided was the forced dogma that stands in conflict with known facts like a literal seven days creation, etc.

My point in all this is that there are a lot of unknowns outside of our ability to study at present directly. Science has limits since all we can study is what we can observe. Given the limits of our observation scope at this present time we cannot being honest to science eliminate the concept of an outside Creator or Creators. We can simply at best eliminate certain preconceived ideas about such a Being or Beings.