## § 4. Excursus on Natural Theology Lecture 10 <br> Second Philosophical Argument in Defense of the Second Premise of the Kalam Cosmological Argument

We have been looking at the kalam cosmological argument for God's existence. Last time we began studying the philosophical arguments and the scientific confirmations of the crucial second premise that the universe began to exist.

We looked at Ghazali's first philosophical argument based upon the impossibility of the existence of an actually infinite number of things. But he has a second philosophical argument as well. This argument is independent of the first argument. That is to say, even if you think that an actually infinite number of things can exist, this argument aspires to show that the series of past events (at least) cannot be actually infinite.

The series of past events, Ghazali observes, has been formed by adding one event after another. The series of events in the past is like a sequence of dominoes falling one after another until the last domino today is finally reached. But, he argues, no series which is formed by adding one member after another can be actually infinite, for you cannot pass through an infinite number of elements one element at a time.

I think this is easy to see in the case of trying to count to infinity. No matter how high you count there is always an infinity of numbers left to count. Therefore no one can count to infinity. He can go on and on, and infinity will simply be a limit to the series of numbers he counts, but he will never arrive at infinity.

But if you cannot count to infinity, how can you count down from infinity? This would be like someone's claiming to have counted down all of the negative numbers ending at 0 . -$3,-2,-1,0$. That seems crazy, for before he could count zero he would have to count -1 . But before he could count -1 he would have to count -2 . But before he could count -2 he would have to count -3 . And so on and so on back to infinity. Before any number could be counted an infinity of numbers would already have to have been counted first. So you just get driven back and back into the past so that no number could ever be counted. But then the final domino would never fall if an infinite number of dominoes had to fall first. So today could never be reached. But obviously here we are. This shows that the series of past events must be finite and have had a beginning.

## START DISCUSSION

Student: I understand the argument, but what are the objections to how someone can say, like the atheist says, how do you reach a past infinite event?

Dr. Craig: Honestly, I read the responses to the kalam cosmological argument and I can't think of any atheistic response to this as to how you could count down an infinite number of events to arrive at today. Here is a response that is sometimes given, and I think we already encountered it. They will say, Look, any negative number you pick is only a finite distance from zero, whether it is -3 or -10 trillion or whatever. So you could count down from that number to 0 . If you have an infinite number of negative numbers you can count down to 0 from every one of them. ${ }^{1}$ So if from every number you could count down to zero (if that is only a finite distance) then it follows there is no problem counting down an infinite series. As I said last week that clearly commits a fallacy called the fallacy of composition which is saying that because a part of a thing has a property therefore the whole thing has the property. A classic example of this fallacy would be to think that every part of an elephant is light in weight therefore the whole elephant is light in weight. That is obviously a fallacious inference. You can't reason that because a part of something has a property therefore the whole has the property. Similarly, in the series of negative numbers, every part of the series is only a finite distance from zero and so could be counted down, but it doesn't follow from that that therefore the whole series can be counted down. The objector has clearly committed the fallacy of composition. The question is not how any finite part of the series can be traversed or counted. The question is how the whole infinite series could be traversed or counted. That just isn't answered by this fallacious sort of objection.

Student: This is something that has actually bothered me as a physicist and astronomer. Current models of the universe would say that the universe is flat, therefore according to the principle of homogeneity it has no edge so it goes on for infinity. But it would have started from the Big Bang as a mathematical point, so it went from size 0 to size infinity.

Dr. Craig: That is a real problem. I've asked cosmologists about that. It is very difficult to make sense of that. I think what many would say (and what I would say) is that the universe is not in fact flat. It is not like a Euclidean plane that goes out to spatial infinity. Rather, space is curved like the surface of a sphere. On the surface of a sphere there is no edge where you are going to fall off, but what will happen is if you go far enough you just come back to where you start again. If three dimensional space is like that then there is no problem in it having this sort of beginning and making this magical leap, as you say, from a singular beginning point to infinite size. That is just avoided by saying that the universe is spatially finite. That is a good question, not tangential.

Student: Doesn't Stephen Hawking try to curve off the bottom of the light cone to avoid this idea of a beginning of time? I never understood how that avoids it because even if it's curved there is still a bottom point.

Dr. Craig: Yes. What you point out, and we'll talk more about this when we get to the scientific confirmation of the beginning of the universe, is that if we let this disc represent our three-dimensional space, as you go back in time space shrinks down to a singular point which is a boundary or an edge to space and time. In Hawking's model he does some mathematical tricks to eliminate that beginning point and round off. It is sort of like a southern hemisphere of the Earth or a badminton birdie. It doesn't go back to a singular point at which you drop off the edge. Rather, if you go back, as I say as on a sphere, you just keep going and you'll go right past the south pole. The south pole on the Earth is not an edge or a boundary where you fall off. If you go south and you go through the south pole you just start going north again. There isn't any boundary point. As you say, Hawking mistakenly thinks that because in his model there isn't any boundary point that therefore there is no beginning to time and the universe. I am actually letting the cat out of the bag from my talk that I am going to be giving at the EPS conference in November, but you are quite right in pointing out to us that on Hawking's model, time here (which is the vertical dimension) is still finite. The universe has not existed infinitely into the past. It is finite and has a beginning. It just doesn't have an edge or a boundary point as a cone does. I have to say that in his most recent book, The Grand Design, co-authored with Leonard Mlodinow, Hawking does admit exactly what you said. ${ }^{2}$ [We can let the lines of] latitude represent time so that as you go back in his model he says you finally reach the south pole, and this is the beginning of the universe. It is the beginning of time and space. He actually admits exactly what you are saying. It doesn't have to be a boundary point or singularity in order for it to be the beginning of time and space. We will talk more about that when we get to the science.

Student: I know that you distinguish eternity for God and time within our world in the universe. Can God count outside of the universe?

Dr. Craig: Let's recall our discussion of the attributes of God when we talked about divine eternity. Remember we said the core concept of eternity means to be without beginning or end - something that exists permanently. But we saw that you could do that in two radically different ways. One would be to endure throughout infinite time without beginning or end; the other way would be to be outside of time altogether - to transcend time or to be timeless. Theologians have typically thought that God is eternal in the sense that he is outside time. But when we are talking about the universe being past eternal, we don't mean the universe is outside time. We mean that first model - extended throughout infinite time. So the question is: can the universe be past eternal in that sense of going back in time to infinity? Can there be an infinite number of prior events before today?
So, can God count infinitely? I would say that insofar as God is in time . . . and my argument, you remember when we talked about his attribute of eternity, is that God is in
time with the universe - once time comes to exist God enters into time in virtue of his real relations with his created world. So God could start counting at the moment of the Big Bang and he would then count forever, but he would never reach infinity because you can't count to infinity. That is metaphysically impossible. Any finite number you count plus one is always another finite number. That is why you cannot reach infinity by counting one number at a time.

Student: So prior to the existence of the universe, God wasn't able to count?
Dr. Craig: I would say yes he was able to count and in that sense had he been counting time would have started prior to the Big Bang. We could imagine God leading up to the moment of creation by saying, " $3,2,1$, Let there be light!" In that case you would have a succession of mental events prior to creation. Yes, he would be able to be counting. But I would say that not even God could count down from infinity past because that is metaphysically impossible.

Student: I was wondering if you were going to address objections where someone offers a hypothetical scenario - a widget is able to make a copy of itself in a half a second, then in a quarter of a second, eighth of a second. Any time before one second is finite. Once you are past one second it gets infinite and presumably weirder and weirder as you go beyond one second.

Dr. Craig: What you are alluding to is the claim of some philosophers that there are things called supertasks, and that is you could form a collection that is actually infinite by doing it faster and faster and faster. You could imagine a machine that moves a marble from one tray to another. It moves the first marble in one minute, then it moves the next marble in 30 seconds, then it moves the next marble in 15 seconds, and faster and faster so that after 2 minutes all of the marbles would be transferred and it would have completed an infinite number of tasks in a finite amount of time. ${ }^{3}$ I would argue that this sort of idea of a supertask is, again, metaphysically impossible.

How do I explain this simply? Let's use the letter omega $(\Omega)$ to symbolize that process that is going on of transferring the marbles. $\Omega$ is an ordinal number of infinity. You say, Wait a minute, I thought that the number of infinity was $\aleph_{o}-$ the Hebrew letter aleph. Well, to be precise that is the cardinal number of infinity. What is the difference between cardinal numbers and ordinal numbers? Cardinal numbers are numbers like 1, 2, 3, 4, 5 . Ordinal numbers are numbers like 1st, 2nd, 3rd, 4th, 5th. The cardinal numbers tell you how many things there are. The ordinal numbers tell you the order in which they are first, second, third, fourth, fifth. The order type or ordinal number of infinity is $\Omega$. After you have completed the transfer of the marbles, you have a new state - the marbles are all now in the left hand tray whereas when you began that were all in the right-hand tray.
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That would be the state designated by $\Omega+1$. All of the states transferring the marbles were going on during the $\Omega$ state. Now you are done. That is $\Omega+1$. The state that is after the process. Notice here that there is no last member in this $\Omega$ series. There is no last marble that gets transferred from the right to the left because it is just infinite. What that means is that the state that exists at $\Omega+1$ is completely indeterminate with respect to the $\Omega$ series. It would be a causal gap in nature. One philosopher who discussed this used the example of a light that is turned on and off faster and faster. His question was, at $\Omega+1$ is the light on or is it off? The answer is there isn't any answer because the state of the lamp at $\Omega+1$ is completely unconnected to its state during the $\Omega$ series. That may be fine mathematically or on paper, but in reality, as I say, that means there is a sort of hole or a causal gap in nature where the state of the lamp at $\Omega+1$ is completely unrelated to the series of turning it on or off, or where the state of the marbles at $\Omega+1$ is unrelated causally to the state of the marbles during the series. My argument would be that, again, this kind of supertask is metaphysically impossible because there is a causal gap in reality on this model that makes no metaphysical sense.

Of course, in talking about whether you can have an infinite number of past events, we are not talking about doing an infinite number of things in a finite amount of time. We are talking about a series where all of the intervals are equal - an infinite number of years or an infinite number of seconds, or an infinite number of days. There is no faster and faster. In one sense this question is purely academic because it doesn't apply to the series of past events which are all equal in duration. There you can't appeal to this speeding up in order to get the job done. As you can see, these arguments are just the tip of the iceberg that leads into fascinating discussions.

## END DISCUSSION

Al-Ghazali sought to heighten the impossibility of forming an actually infinite past by giving illustrations of the absurdities that would result if you could form an actually infinite past by adding one member after another. ${ }^{4}$ He says let's imagine our solar system. Here is Saturn. Let's imagine that for every one orbit that Saturn completes around the sun Jupiter (which is closer in) completes two. Notice that the longer they orbit, the further Saturn falls behind. If Jupiter has done ten trillion orbits, Saturn has only done five trillion. The longer they orbit the further and further Saturn falls behind. If they continue to orbit forever they will approach a limit at which Saturn is infinitely far behind Jupiter. Of course they will never actually arrive at this limit but nevertheless they will approach this limit the longer they orbit.

Now turn the story around, says al-Ghazali. Suppose they have been orbiting the sun from eternity past. Now which one has completed the most orbits? The answer

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mathematically is that the number of orbits completed is exactly the same: they have both completed infinity - an infinite number of orbits! Notice you can't get out of this argument by saying that infinity is not a number. Because it is a number in this case. We are dealing with an actually infinite number of orbits. So it is a number. In mathematics, infinity is a number (in set theory at least) - it is the number of elements in the set of natural numbers $\{0,1,2,3,4, \ldots\}$. So if they have been orbiting from eternity past at the rate of two orbits of Jupiter to every orbit of Saturn they have now both completely the same number of orbits. But that seems absurd because the longer they orbit, the more the disparity between them grows. So how does the number of orbits magically become equal just by having them orbit from eternity past? As I say, this is his [al-Ghazali] argument from the $12^{\text {th }}$ century. It is just amazing to read this stuff.

Here is one more little juicy tidbit about this illustration. Al-Ghazali asks: is the number of orbits completed odd or even? You know what the answer is mathematically? It is both. It is both odd and even. That, again, I think just shows the absurdity of trying to form an actually infinite number of things by successive addition.

Here is another illustration. Suppose we meet a man who claims to have been counting down from eternity past and is now finishing: . . . $-3,-2,-1,0$ ! Whew! At last! Why, we may ask, is he just now finishing his countdown today? Why didn't he finish it yesterday or the day before that, or the year before that? After all, by then an infinite amount of time had already elapsed. So if the man were counting, say, at the rate of one number per second, he's already had an infinite number of seconds to finish his countdown. He should already be done! In fact, at any point in the infinite past you pick, the man will already be finished with his countdown, which implies that no matter how far back in time you go you will never find the man counting. That contradicts the hypothesis that he has been counting from eternity. This, again, I think shows the absurdity of trying to form an actually infinite by adding one member after another.

## START DISCUSSION

Student: I know that guys like Wes Morriston, regarding the point made about when you ask why hasn't he finished counting down yesterday or the day before that, will try to say that is a non sequitur. Just because we can't postulate a reason for why they haven't finished their countdown doesn't mean there isn't a reason for it. ${ }^{5}$

Dr. Craig: I think it is very clear that there cannot be a reason for finishing today rather than tomorrow or finishing today rather than yesterday. There simply isn't any reason that could be given why one point in the past would be the point at which he finishes. I think what someone like Morriston would rather have to say is there doesn't need to be a reason - it just is that way. That would be an acceptable response. But I guess what I
would say in a case like that is that given an infinite amount of time, that is a sufficient condition for finishing his countdown and therefore he should be done by now.

Student: I know what he says to that though. He'll say something like isn't there a difference between counting down an infinite amount of the past versus all of the past. Isn't it possible somebody could have counted infinitely but still not have gotten to the present because isn't there a difference between the two?

Dr. Craig: That is a good point. There is a difference between counting all the numbers and counting an infinite number of numbers. But in this case it would seem to me that if you are counting at one number per second you would finish counting all the numbers. There is no reason as to why you would finish tomorrow rather than today or yesterday rather than today. Having an infinite amount of time would be a sufficient condition for counting all the numbers in the negative number series.

Student: It keeps going around in my mind that if he had to have a finish, where and when would he have begun in the first place?

Dr. Craig: It is important to understand that he did not have a starting point. Just as the series of negative numbers has no beginning point - there is no largest negative number so the series of past events in a beginningless universe would have no beginning point, which makes it all the more unintelligible, I think. For him to arrive at today is kind of like trying to jump out of a bottomless pit. Think about that. There isn't any beginning point whereas to get leverage so to speak; it just sinks into an infinite regress. It becomes unintelligible how the man could get to any point in the past, I think.

Student: When I am thinking about this, something that comes to mind is can God make a rock so big that he can't lift it. Is that analogous to the question that can God traverse an actual infinite?

Dr. Craig: What you are saying is that is a logically impossible task, or a metaphysically impossible task for God to do. Therefore it is no infringement on his omnipotence. Similarly, al-Ghazali and I would say these are metaphysically impossible things and therefore it is no infringement on God's omnipotence that he couldn't do such a thing.

## END DISCUSSION

It is always encouraging when one's philosophical colleagues express support for an argument and you manage to make some impact upon the territory. Therefore, I have been tremendously encouraged that two very brilliant and gifted philosophers Alexander Pruss of Baylor University and Rob Koons of University of Texas at Austin have recently both defended a very engaging contemporary version of Ghazali's argument. This is called the Grim Reaper Paradox.

Imagine there are infinitely many grim reapers who are bent on your destruction. We can identify these as gods so as to forestall any physical objections. Suppose you are alive at midnight, and that grim reaper $\# 1$ will strike you dead at 1:00am if you are still alive at that point. But grim reaper \#2 will strike you dead at 12:30am if you are still alive at that point. But grim repeater \#3 will strike you dead at $12: 15 \mathrm{am}$, and so on and so on. Such a situation seems clearly conceivable given the possibility of an actually infinite number of things. ${ }^{6}$ But it leads to an impossibility. You cannot survive past midnight, but you cannot be killed by any grim reaper at any time because you would already be dead first. Pruss and Koons show how to reformulate this paradox so that the grim reapers are spread out over infinite time rather than over a single hour. For example, you can stipulate that each grim reaper will swing his scythe on January 1 of each past year if you have managed to live that long. You will get the same sort of paradox - you cannot survive to the present and yet you cannot be killed by any grim reaper at any time. This shows, again, the impossibility of an actually infinite past.

Let me just conclude by saying that these illustrations, I think, go to strengthen alGhazali's claim that no series which is formed by adding one member at a time can be actually infinite. ${ }^{7}$

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    $7 \quad$ Total Running Time: 31:57 (Copyright © 2015 William Lane Craig)

